296

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Four new species of canestriniid and heterocoptid mites from China

(Acari, Astigmata, Canestriniidae, Heterocoptidae)

Ryszard Haitlinger

Haitlinger, R. (1998): Four new species of canestriniid and heterocoptid mites (Acari, Astigmata, Canestriniidae, Heterocoptidae) from China. – Spixiana **20/1:** 1-10

Two new species of canestriniid mites (Canestriniidae) and two new species of heterocoptid mites (Heterocoptidae) are described from China. *Photia melchiori*, spec. nov. is associated with *Carabus* spec. (Carabidae) and *Canestrinia kacperi*, spec. nov. is associated with *Carabus subformosus* (both Canestriniidae). *Heterocoptus kamillae*, spec. nov. is associated with *Aspidomorpha miliaris* (Chrysomelidae, Cassidinae) and *H. hannae*, spec. nov. is associated with *Basipronota bisignata* (Cassidinae) (both Heterocoptidae).

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Introduction

To date, rather few species belonging to the families Canestriniidae and Heterocoptidae are known from China, Thibet, Taiwan, Hainan, and Hongkong. The first descriptions of canestriniid mites from China, Thibet, and Taiwan were given by Samšinák (1971). He described *Canestrinia pekingensis* from China and Thibet and *C. illegalis* from Taiwan. Later, Summers & Schuster (1981, 1982) described from passalid beetles: *Apalotacarus trullus* associated with *Leptaulax bicolor formosanus* Doesburg and *A. aristatus* associated with *Aceraius grandis hirsutus* Kuwert, both from Taiwan; moreover *Melisia superba* associated with *A. g. hirsutus* from Taiwan and *M. sentosa* associated with undetermined Passalidae from Hainan. The following species have been described in subsequent years: *Coleopterophagus belzebubi* Haitlinger associated with *Potosia aerata* (Er.) from Taiwan, *P. funebris* (Gory & Perch.) from China, *C. rudolfi* Haitlinger associated with *P. brevitarsis* (Lewis) from China, *Gioharattia maharae* Haitlinger associated with *Thaumestopeus cupripes* Wal. (Cetoniinae) from Hongkong, *Percanestrinia viviannae* Haitlinger from undetermined host from China, *Beeriphotia volkeri* Haitlinger associated with *Carabus angulicollis antaeus*, *Canestrinia ramoni* Haitlinger associated with *C. coelestis giganteus*, and *C. paavoi* Haitlinger associated with *C. grandis* (Carabidae), all from China (Haitlinger 1989, 1990b, 1992, 1994). Additional 14 species were described from various extra-Chinese countries: *Uriophela arieli* Haitlinger from Far East of Russia, *Photia polymorpha* Samšinák from Siberia and Japan, *Canestrinia pictura* Samšinák and ?*Coleopterophagus berlesei* Kishida, both from Japan, *Apalotacarus protensis* Summers & Schuster and *Canestrinia vlachiana* Samšinák, both from North India, *Contramelisia vietnamensis* Samšinák, *Melisia baloghi* Samšinák, *M. mahunkai* Samšinák, *M. occidii* Samšinák, *M. jadwigae* Haitlinger, *M. rutae* Haitlinger, *M. helenae* Haitlinger and *M. hieronimae* Haitlinger, all from North Vietnam (Kishida 1924, Samšinák 1969, 1971, Summers & Schuster 1981, Haitlinger 1990a, 1991). This a rather small number of species, and one should to expect many more species of canestriniids on these territories.

The knowledge of Heterocoptidae in China is restricted to only one species from Hainan: *Honiarrea lagossa* Haitlinger associated with *Passandra heros* (Passandridae) (Haitlinger 1990c). In general, knowledge of this family is very unsatisfactory because only 10 species are known thorughout the world. Besides the species mentioned above, from Asia were recorded also *Heterocoptes tarsii* Fain from Borneo (Sarawak), *H. nolae* Haitlinger from Andaman Isl., *H. lottae* Haitlinger from North Vietnam, *Cassiocoptes mikki* Haitlinger from Sumatra, *Nolaecoptes vonettae* Haitlinger from Sikkim, and *Abboticoptes eddae* Haitlinger from Philippines (Fain 1967, Haitlinger 1996).

In this paper two new species of canestriniid mites and two new species of heterocoptid mites are described, all from China.

The type material is deposited in the Museum of Natural History, Wrocław University (MNHWU) and in the Institute of Systematic and Experimental Zoology of the Polish Academy of Sciences, Cracow (ISEZPAS).

Terminology

The terminology of structure and setal notation is based on Fain (1987) and Haitlinger (1994). Gnathosoma length (GL) was measured between base and tip of rostrum; gnathosoma width (GW), at posterior margin of gnathosoma. All tarsi (Ta) were measured excluding pads. Length of ultralong setae is given approximately. These setae are most often convolute. All measurements are given in micrometers (μm).

Photia melchiori, spec. nov.

Figs 1-6

Types. Holotype: ♀, ex *Carabus* spec. (Coleoptera, Carabidae), from unknown locality in China. – Paratypes: additional 4♀♀ (MNHWU).

Diagnosis. *Photia melchiori*, spec. nov. differs from other species of the genus by the following combination of characters: 1. the bases of setae l1, l2 and d1 are shifted relatively far from the line that divides propodosoma from hysterosoma (character shared with *P. hejniana* Samšinák, *P. saetolata* Cooreman, and *P. graeca* Cooreman); 2. very long setae l1, l2 (shared charecter with *P. lusitanica* Samšinák): 3. only 6 pairs of setae in anal and postanal regions (without setae l5, d5); 4. very short posterior margin of idiosoma and narrowing opisthosoma.

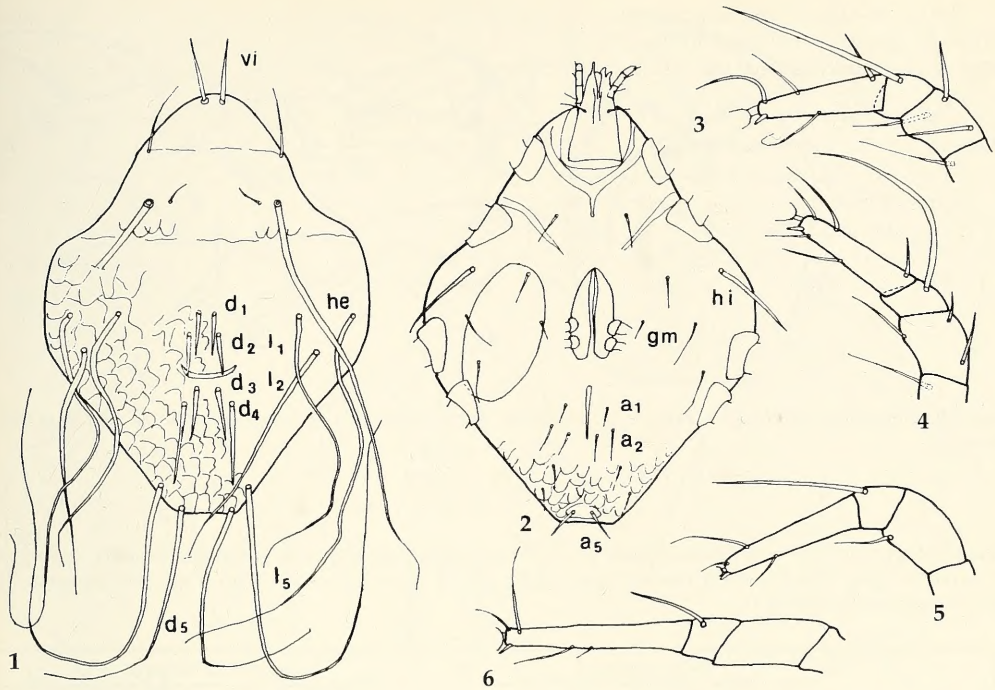
Description

Female holotype. Idiosoma longer than wide. Dorsum of idiosoma with 13 pairs of setae; 6 pairs as sce, l1, l2, l5, d5, he ultralong. The seriae d in median line of dorsum; setae d5 are ultralong, among the remaining ones d4 are the longest. The distance between bases of setae d2 is greater than between setae d1; also distance between bases of setae d4 is greater than between setae d3. Between setae d2 and d3 a curved cuticular formation is situated. The bases of setae d1 and l1 are distinctly shifted to the back relatively far from the line separating propodosoma from hysterosoma. Setae l2 placed near setae l1. The bases of setae he on almost the same level as l1. Setae sci very small. Setae vi relatively long and thick; below them placed thin setae scx. Both sides of idiosoma and its posterior area ornamented as in Fig. 1. The ornamental lines also placed below bases of sce.

Ventral side of idiosoma with ornamentation on posterior region; it bears one pair of relatively long setae hi, two pairs of genital setae and three pairs of anal setae beside the anal opening. Moreover there are three pairs of setae cx. Gnathosoma relatively long (Fig. 2).

Legs I-IV as in Figs 3-6; tarsi IV distinctly longer than the remaining ones, with pairs of medioventral setae; proximal seta about 3 times as long as those of posterior seta (Fig. 6). Solenidia on tibiae I-III distinctly longer than solenidion on tibia IV. Dorsal distal seta on genu I somewhat shorter than two remaining setae; dorsal distal seta on genu II at least half as long as the remaining ones (Figs 3-4). For measurements see table 1.

Etymology. The name of the species was derived from the name Melchior.



Figs 1-6. *Photia melchiori,* spec. nov., ♀. **1.** Idiosoma, dorsal view. **2.** Idiosoma, ventral view. **3.** Leg I, tarsus-femur. **4.** Leg II, tarsus-femur. **5.** Leg III, tarsus-genu. **6.** Leg IV, tarsus-genu.

Canestrinia kacperi, spec. nov.

Figs 7-18

Types. Holotype: ♀, ex *Carabus subformosus* Sem., Guanzhou (Kanton), China. – Paratypes: 1♀, 2♂♂, same data as holotype (ISEZPAS).

Diagnosis. *Canestrinia kacperi,* spec. nov. is very similar to *C. ramoni* Haitlinger. Females can be distinguished from this species by dorsal ornamentation, shorter setae vi (62-64 to 102), longer tarsi I-IV (Ti III greater about 28 nm) and gnathosoma (120 to 100); males of *C. ramoni* are unknown. Males of *C. kacperi* are similar to *C. illegalis* Samšinák. They differ by shape of opisthosoma, the greater distance between suckers, thicker setae a4 and the distance between d3-d4.

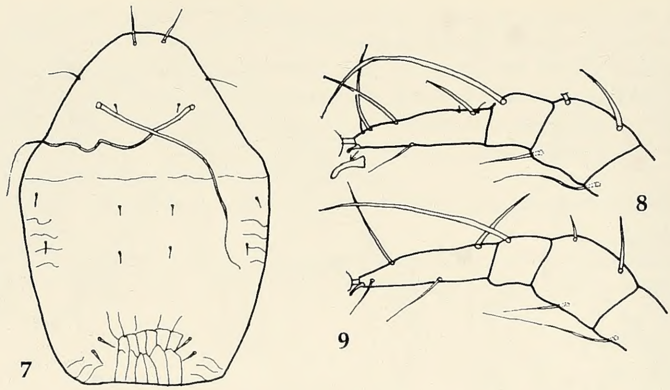
Description

Female holotype. Dorsum weakly ornamented in posterior part and very weakly at lateral margins. Suture between propodosoma and hysterosoma present. Idiosoma longer than wide; it bears 12 pairs of dorsal setae, 3 pairs of setae long: sce, he, l5, (setae he and l5 on margins of the idiosoma – Fig. 16); 9 pairs of setae short of which vi, d3 and d4 are somewhat longer and thicker than the others. Distance between bases of setae d3, d4 greater than between bases of setae d1, d2 (Fig. 7).

Ventral side of idiosoma with 2 pairs of short genital setae and 6 pairs of anal setae. Posterior to anal region 2 pairs of rather short setae and 2 pairs of long setae. At posterior margin of opisthosoma a small caudal capsule is situated. Gnathosoma rather short (Fig. 16).

Legs III-IV with tarsi longer than tarsi I-II; tarsi IV longest (Figs. 17-18). Setae on tibiae I-III distinctly longer than seta on tibia IV. Both genua I-II with a dorsal distal seta that is shorter than the dorsal proximal seta (Figs. 8-9).

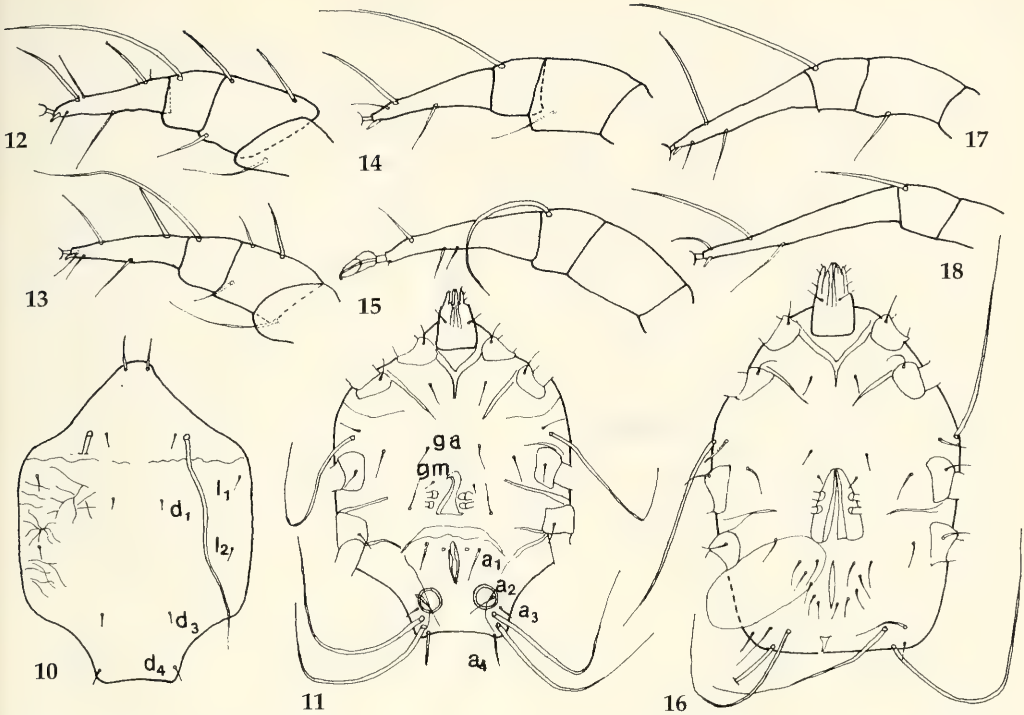
For measurements see table 1.



Figs 7-9. *Canestrinia kacperi*, spec. nov., ♀. **7.** Idiosoma, dorsal view. **8.** Leg I, tarsus-femur. **9.** Leg II, tarsus-femur.

Tab. 1. Metric data for *Photia melchiori*, spec. nov. and *Canestrinia kacperi*, spec. nov. Abbreviations: H: holotype; P: paratype; gda: dorsal anterior seta on genu I; gdp: dorsal posterior seta on genu I; sge: seta on genu III; st: setae on trochanters III-IV.

	Photia melchiori					*Canestrinia kacperi*						
	H ♀	P ♀	P ♀	P ♀	P ♀	H ♀	P ♀	P ♂	P ♂	P ♂	P ♂	P ♂
Length of idiosoma	504	560	568	592	576	645	728	512	544	632	576	560
Width of idiosoma	400	416	420	464	460	472	536	408	456	528	456	448
Gl	100	100	92	120	96	120	126	96	112	100	104	104
GW	56	60	60	60	62	62	70	52	60	66	64	70
Genital apparatus	–	–	–	–	–	–	–	–	86	80	84	–
vi	74	64	66	76	74	62	64	54	62	56	60	52
d1	52	54	–	–	52	20	–	–	–	–	–	–
d2	58	–	–	–	–	18	–	–	–	–	–	–
d3	56	60	60	62	76	40	–	–	–	–	–	–
d4	100	108	106	120	116	30	–	–	–	–	–	–
d5	330	290	330	390	–	330	–	–	–	–	–	–
11	310	280	280	332	316	22	24	–	24	–	–	–
12	264	290	296	270	–	20	–	–	–	–	–	–
13	–	–	–	–	–	92	–	–	–	–	–	–
14	–	–	–	–	–	30	–	–	–	–	–	–
15	544	500	–	532	–	440	–	–	–	–	–	–
hi	100	94	84	100	86	44	50	40	40	–	40	40
sci	22	22	20	26	24	24	26	–	22	26	26	22
Ta I	74	76	72	80	76	82	86	80	80	80	76	76
Ta II	–	74	74	80	76	84	84	–	78	86	74	74
Ta III	94	100	100	104	102	110	108	84	90	–	84	88
Ta IV	126	122	126	132	132	140	136	106	112	110	106	108
SoTi I	136	140	142	140	–	170	162	140	140	142	142	140
SoTi II	130	120	–	140	134	154	–	126	130	134	134	126
SoTi III	114	110	100	106	108	140	126	120	120	120	124	124
SoTi IV	65	54	42	60	50	56	74	90	88	86	94	86
gda	40	40	40	40	36	–	38	40	42	40	44	–
gdp	46	–	44	42	40	54	46	52	50	56	50	46
sge	–	50	40	66	48	44	44	40	44	40	–	–
st III	–	32	40	–	30	40	–	–	46	–	–	–
st IV	–	36	42	–	34	42	–	–	40	–	–	–



Figs 10-15. *Canestrinia kacperi*, spec. nov., ♂. **10.** Idiosoma, dorsal view. **11.** Idiosoma, ventral view; **12.** Leg I, tarsus-femur. **13.** Leg II, tarsus-femur. **14.** Leg III, tarsus-genu. **15.** Leg IV, tarsus-genu.
Figs 16-18. *Canestrinia kacperi*, spec. nov., ♀. **16.** Idiosoma, ventral view. **17.** Leg III, tarsus-genu. **18.** Leg IV, tarsus-genu.

Male. Dorsum of idiosoma with ornamentation at lateral margins. Suture between propodosoma and hysterosoma present. Opisthosoma narrow with short posterior margin. All dorsal setae, except sce, short. Setae vi somewhat longer and thicker than other ones (Fig. 10).
Ventral side of idiosoma with one pair of anterogenital setae ga above genital apparatus and four setae in genital region. Genital apparatus as in Fig. 11. Between genital apparatus and anal opening a trapeziform cuticular formation is situated. Between coxae IV and posterior margin of opisthosoma a cuticular fold. Distance between two big suckers relatively large. Gnathosoma as in Fig. 11.

Legs IV bear the longest tarsi; medioventral with two setae unequal in length. Tarsi I-III with ventroapical spur which is very small. All setae on tibiae I-III almost subequal in length; seta on tibia IV curved and shorter (Fig. 15). Dorsal setae on genu I almost equal in length, ventral apical seta somewhat thinner (Fig. 12). Dorsal setae on genu II unequal; distal seta distinctly shorter (Fig. 13).

For measurements see table 1.

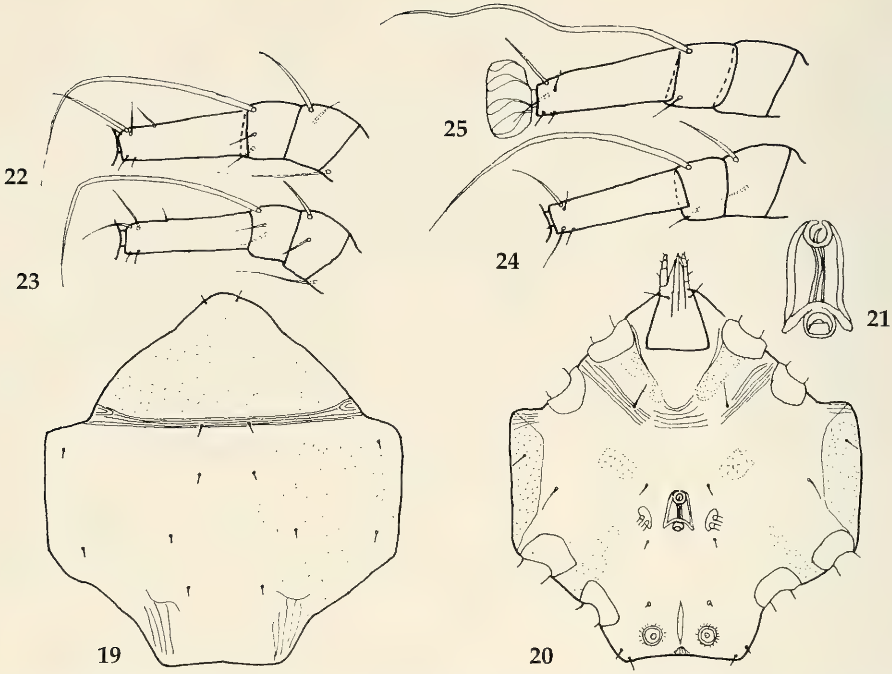
Etymology. The name of the species was derived from the name Kacper.

Heterocoptes hannae, spec. nov.

Figs 19-31

Types. Holotype: ♂, Shanghai, China, obtained from *Basipronota bisignata* (Boheman) (Coleoptera, Chrysomelidae, Cassidinae). – Paratype: 1♀, same data as holotype (MNHWU).

Diagnosis. *Heterocoptes hannae*, spec. nov. differs from *H. tarsii* Fain (males) by only punctated dorsum, without ornamentation, shape of genital apparatus and opisthosoma, and ornamentation on ventral



Figs 19-25. *Heterocoptes hannae,* spec. nov., ♂. **19.** Idiosoma, dorsal view. **20.** Idiosoma, ventral view. **21.** genital apparatus. **22.** Leg I, tarsus-femur. **23.** Leg II, tarsus-femur. **24.** Leg III, tarsus-genu. **25.** Leg IV, tarsus-genu.

surface. From *H. kamillae,* spec. nov. males differs in shape of posterior margin of opisthosoma (almost straight), punctated areas at lateral margins on ventral surface, and distinctly shorter solenidia on tibiae I-IV. Females of *H. hannae* differ from females of *H. kamillae* in dorsal and ventral ornamentation and shorter solenidia I-IV.

Description

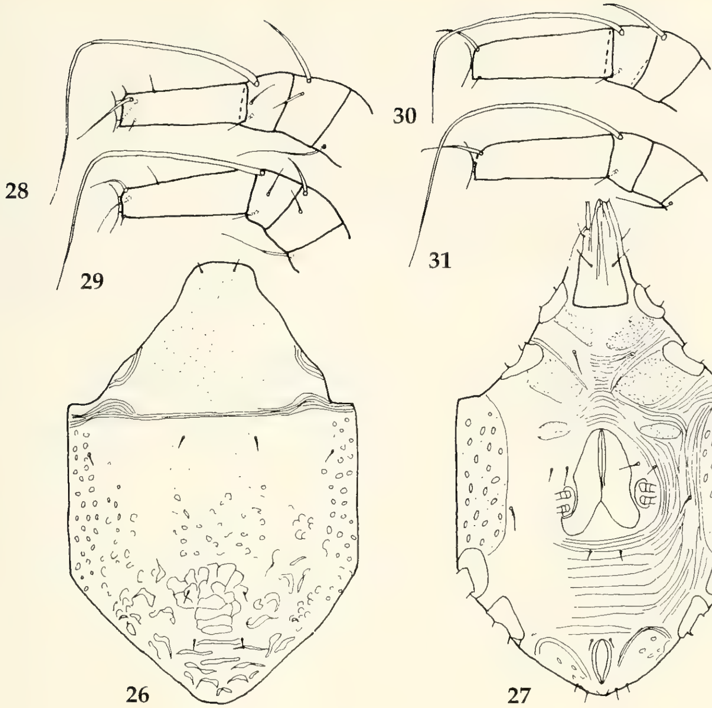
Male holotype. Idiosoma slightly longer than wide. Opisthosoma very short. Transverse lines divide propodosoma from hysterosoma. Dorsum punctated except for median part, and with some longitudinal lines on posterior margin. All dorsal setae minute (Fig. 19). Ventral posterior margin of idiosoma bears two suckers. Distance between suckers relatively long. Anal opening placed between suckers and near posterior margin of idiosoma. Genital apparatus as in Fig. 21. Ventral surface of idiosoma with punctated area at coxae I, between coxae III-IV, at lateral margins of idiosoma, and somewhat above genital apparatus. Cuticular lines visible between coxae I-II and beyond coxae IV. Ventral setae very short. Near posterior margin of idiosoma two pairs of setae and above suckers one pair of minute setae. Genital region with two pairs of setae. Setae hi on punctated area. Gnathosoma as in Fig. 20.

Legs I-IV with very long solenidia and tibiae; solenidion on tibia IV somewhat longer than the remaining ones (Figs 22-25). Genu I with distal seta (dorsal) about three times longer than proximal seta. Differences of length of setae on genu II distinctly less (Fig. 23).

For measurements see table 2.

Female. Idiosoma longer than wide. Transverse lines divide propodosoma from hysterosoma. Whole propodosoma punctated; hysterosoma only in its anterior part, the rest of dorsal surface ornamented as in Fig. 26. Dorsal setae very short. Ventral side of idiosoma with anus near its posterior margin. Whole ventral surface ornamented; at lateral margins with punctated and circular areas; additional punctated areas situated at coxae I and II and somewhat below them. The remaining areas covered by lines (Fig. 27). Two pairs of setae on posterior margin of idiosoma, one pair in anal region, two pairs in genital region, and one pair below this region. Gnathosoma as in Fig. 27.

Legs I-IV as in males with solenidia on tibiae III-IV not longer than solenidia on tibiae I-II. Distal seta



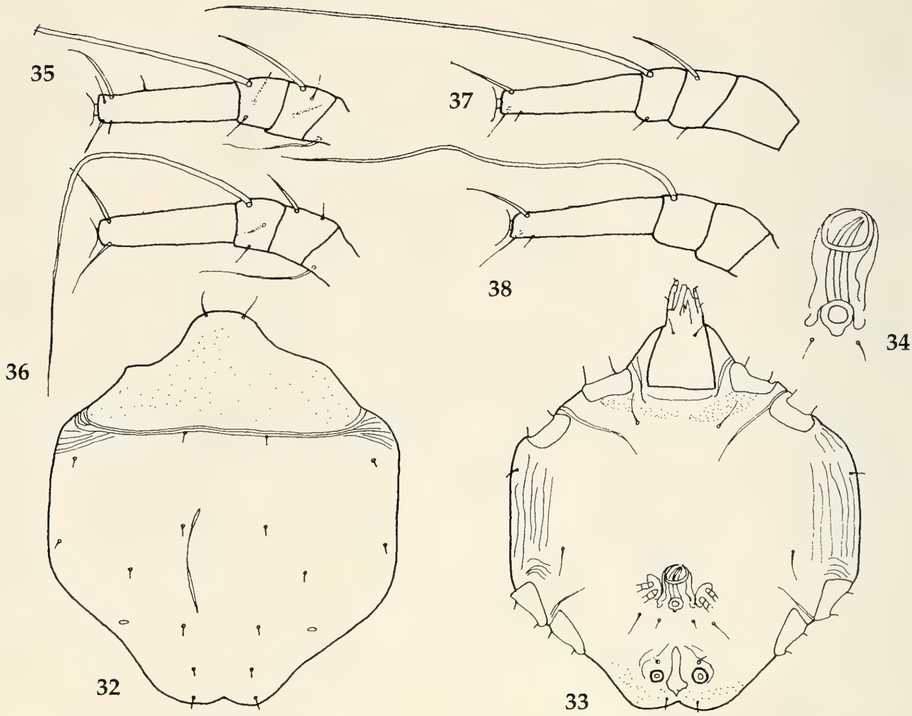
Figs 26-31. *Heterocoptes hannae*, spec. nov., ♀. **26.** Idiosoma, dorsal view. **27.** Idiosoma, ventral view. **28.** Leg I, tarsus-femur. **29.** Leg II, tarsus-femur. **30.** Leg III, tarsus-genu. **31.** Leg IV, tarsus-genu.

on genu I distinctly longer and thicker than proximal seta; differences between setae on genu II smaller.
For measurements see table 2.

Etymology. The name of the species has derived from the name Hanna.

Tab. 2. Metric data for *Heterocoptes hannae*, spec. nov. and *H. komillae*, spec. nov. H: holotype, P: paratype.

	H. hannae		*H. komillae*	
	H ♂	P ♀	H ♂	P ♀
Length of idiosoma	492	528	496	464
Width of idiosoma	444	408	416	412
Genital apparatus	50	–	52	–
D	46	–	26	–
GL	106	108	108	94
GW	78	76	76	76
vi	–	–	20	20
Ta I	92	102	94	88
Ta II	92	102	96	94
Ta III	92	110	96	102
Ta IV	96	120	96	102
SoTi I	~216	~240	306	256
SoTi II	~ 204	222	296	266
SoTi III	206	~258	324	288
SoTi IV	230	~250	~280	254
sge	52	60	64	–



Figs. 32-38. *Heterocoptes kamillae*, spec. nov., ♂. **32.** Idiosoma, dorsal view. **33.** Idiosoma, ventral view. **34.** genital apparatus. **35.** Leg I, tarsus-femur. **36.** Leg II, tarsus-femur. **37.** Leg III, tarsus-femur. **38.** Leg IV, tarsus-genu.

Heterocoptes kamillae, spec. nov.

Figs 32-44

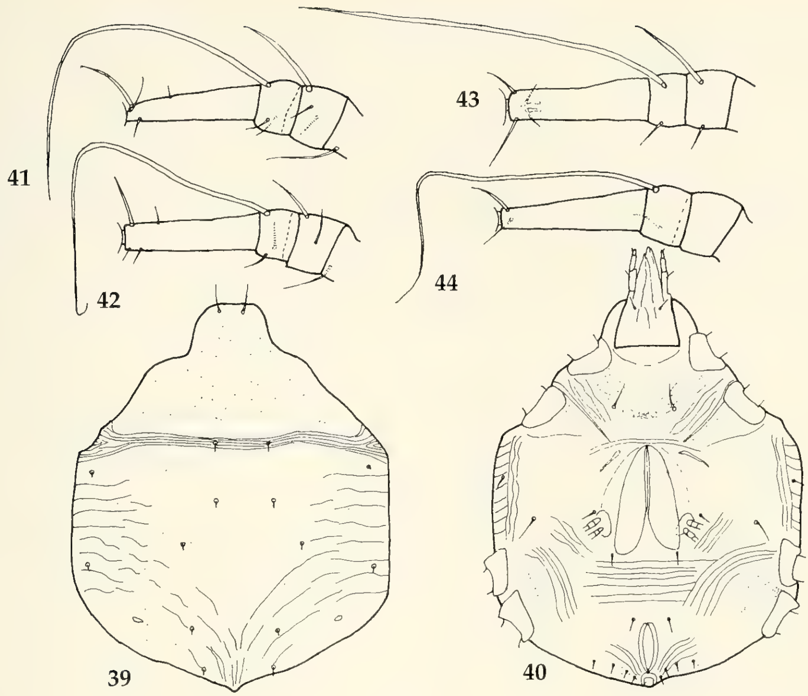
Types. Holotype: ♂, ?Solin-Ho, Yunnan, China, obtained from *Aspidomorpha miliaris* (L.) (Coleoptera, Chrysomelidae, Cassidinae). – Paratype: 1♀, same data as holotype (MNHWU).

Diagnosis. *Heterocoptes kamillae*, spec. nov. (males) differs from *H. tarsii* Fain by shape of genital apparatus, concave posterior margin of idiosoma, and absence of ornamentation on dorsum. For differences between ♂♂ and ♀♀ of *H. kamillae*, spec. nov. and *H. hannae*; spec. nov. see diagnosis of *H. hannae*.

Description

Male. Idiosoma longer than wide. Posterior margin of opisthosoma concave in central part. Propodosoma divided from hysterosoma by transversal lines. Whole dorsum punctated. All dorsal setae minute, except setae vi which are distinctly longer than the remaining ones. Setae d1 placed on transverse lines that separate propodosoma from hysterosoma (Fig. 32). Ventral surface of idiosoma with punctated areas at coxae I and near posterolateral margins of idiosoma. Longitudinal lines and short transverse lines placed near lateral margins of idiosoma. Two suckers and anus situated near posterior margins of idiosoma. Genital apparatus as in Fig. 34. Gnathosoma longer than wide. All ventral setae short. Below genital region with two pairs of setae; internal pair shorter. Above and below suckers with one pair of setae each (Fig. 33).

Tarsi IV somewhat longer than others. Solenidion on tibia III longer than the remaining ones. Dorsal distal seta on genu I a many times longer than proximal seta and distinctly thicker; also ventral seta short. Dorsal distal seta at least two times longer than proximal seta and distinctly thicker (Figs 35-38).



Figs 39-44. *Heterocoptes kamillae*, spec. nov., ♀. **39.** Idiosoma, dorsal view. **40.** Idiosoma, ventral view. **41.** Leg I, tarsus-femur. **42.** Leg II, tarsus-femur. **43.** Leg III, tarsus-genu. **44.** Leg IV, tarsus-genu.

Measurements. Length of idiosoma 504, width of idiosoma 436, vi 20, genital apparatus 52, TaI 94, TaII 96, TaIII 96, TaIV 96, SoTi I 306, SoTi II 296, SoTi III 324, SoTi IV ~280, distal seta on genu I 64, length of gnathosoma 108, width of gnathosoma 76, distance between anal suckers (measured between their internal margins) 26.

Female. Idiosoma somewhat longer than wide. Entire surface of propodosoma punctated; also hysterosoma on both sides punctated. Propodosoma separated from hysterosoma by transverse lines. Hysterosoma ornamented as in Fig. 39. Opisthosoma very strongly reduced. Setae d1 placed on transverse lines. All dorsal setae minute, except setae vi, which are at least 2-3 times longer. Ventral surface of idiosoma ornamented; punctated areas placed near coxae II and IV; lines arranged obliquely, longitudinally and transversely as shown in Fig. 40. Anal opening near posterior margin of opisthosoma. Above anus a pair of setae; at posterior margin of opisthosoma four pairs of short setae. In genital region two pairs of setae. Gnathosoma longer than wide.

Tarsi I-II equal in length, tarsi III-IV somewhat longer than I and II. Solenidion on tibia III longer than the other ones. Distal setae on genua I, III longer than analogous seta on genu II (Figs 41-44).

Etymology. The name of the species has derived from the name Kamilla.

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New species of the genus *Fortagonum* Darlington from western New Guinea

(Insecta, Coleoptera, Carabidae, Agoninae)

Martin Baehr

Baehr, M. (1998): New species of the genus *Fortagonum* Darlington from western New Guinea (Insecta, Coleoptera, Carabidae, Agoninae). – Spixiana **21/1:** 11-20

Four new species of the genus *Fortagonum* Darlington from western central Irian Jaya, western New Guinea, are described: *F. spinipenne*, spec. nov., *F. sinak*, spec. nov., *F. laevigatum*, spec. nov., and *F. globulipenne*, spec. nov. An updated key to the New Guinean species of *Fortagonum* (sensu Baehr 1995) is presented.

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Introduction

Within a sample of carabid beetles collected by A. Riedel during a recent trip to central Irian Jaya, four new species of the genus *Fortagonum* s. str. were discovered that are described below. Altogether, the genus *Fortagonum* (sensu Baehr 1995) now comprises 22 species, though most probably this is by far not the full number of actually existing species, because most species, even those that are still fully winged, seem to occupy very restricted ranges. Better exploration of the various mountain ranges of New Guinea certainly will result in the discovery of additional species.

For recognition of the new species, the key in my most recent paper (Baehr 1995) is updated and fully repeated below, since I believe this procedure would be more convenient for the user than giving notes for recognition under each of the newly described species.

Measurements and discriminating characters are essentially the same as in previous papers (Baehr 1992, 1995).

The holotypes of the new species are presented to the Zoologische Staatssammlung, München, though are kept as permanent loan in the collection of author (ZSM-CBM).

Updated key to the species of the genus *Fortagonum* Darlington (sensu Baehr 1995)

1. Wings present .... 2.
– Wings absent .... 8.

2. Both pairs of supraocular setae absent .... 3.
– At least posterior supraocular seta present .... 4.

3. Elytra bisetose, elongate, >1.6× as long as wide, only ⅓ wider than pronotum, striae slightly crenulate, intervals depressed. Vogelkop, extreme western Irian Jaya .... *depressum* Baehr

Elytra unisetose, shorter, c. ⅓ longer than wide, c. 1.5× as wide as pronotum, striae not crenulate, intervals slightly convex. Western part of central Irian Jaya .... *sinak*, spec. nov.

4. Both supraorbital setae present. Eastern Irian Jaya .... *bisetosiceps* Baehr
– Anterior supraorbital seta absent .... 5.

5. Elytra unisetose (only median seta present); prothorax little wider than long. Central eastern Irian Jaya .... *denticulatum* Baehr
– Elytra bisetose (median and posterior setae present); prothorax considerably wider than long. Distribution different .... 6.

6. Elytra narrow and elongate, with very elongate sutural spines (Fig. 1). Western central Irian Jaya .... *spinipenne*, spec. nov.
– Elytra wider and shorter, with short sutural spines (see figs 47, 48 in Darlington 1971). Distribution different .... 7.

7. Pronotum wider, sides more straight, anterior angles more protruding. Extreme western Irian Jaya .... *subconicolle* (Darlington)
– Pronotum narrower, sides more convex, anterior angles less protruding. Central Papua New Guinea .... *bigemum* (Darlington)

8. Both supraocular setae absent .... 9.
– Posterior supraocular seta present .... 11.

9. Elytral striae superficial, intervals depressed, surface slightly iridescent. Western central Irian Jaya .... *laevigatum*, spec. nov.
– Elytral striae deeply impressed, intervals markedly convex, surface not iridescent .... 10.

10. Anterior angle of pronotum slightly produced laterally, apex obtuse; elytra longer, ratio l/w >1.32. Central Irian Jaya .... *bufo* Darlington
– Anterior angle of pronotum straight, apex acute; elytra shorter, ratio l/w <1.28. Western central Irian Jaya .... *globulipenne*, spec. nov.

11. Elytra usually trisetose, rarely unilaterally unisetose or bisetose; mandibles never straight and very elongate. Central Papua New Guinea .... 12.
– Elytra asetose, or unisetose, or bisetose; either mandibles straight and very elongate, **or** more or less fusiform species. Central and eastern Irian Jaya .... 15.

12. Posterior pronotal seta present .... 13.
– Posterior pronotal seta absent .... 14.

13. Margin of pronotum wide; wide, fusiform species. .... *oodinum* Darlington
– Margin of pronotum narrow; rather narrow, barely fusiform species .... *antecessor* Darlington

14. Pronotum wider, but less conical; elytra weakly iridescent .... *fortellum* Darlington
– Pronotum narrower, but rather conical; elytra markedly iridescent .... *okapa* Darlington

15. Posterior pronotal seta present; elytra unisetose or bisetose .... 16.
– Posterior pronotal seta absent; elytra asetose .... 18.

16. Pronotum laterally regularly convex, base as wide as apex, basal angles rounded off, apex very protruding; elytra bisetose, anterior seta absent. Eastern central Irian Jaya .... *acuticolle* Baehr
– Pronotum laterally feebly convex, base much wider than apex, basal angles rectangular and obtuse, apex less protruding; elytra unisetose, only median seta present. Eastern Irian Jaya .... 17.

17. Apex of elytra not spinose, though sutural angle faintly denticulate, elytra slightly wider; pronotum barely narrowed towards base (Fig. 9). Area east of mountain range to the west of valley of Borme River .... *unipunctatum* Baehr

– Apex of elytra elongately spinose opposite 3rd interval, sutural angle not denticulate, elytra slightly narrower; pronotum distinctly narrowed towards base (Fig. 10). Area west of mountain range to the west of valley of Borme River .... *spinosum* Baehr

18. Mandibles not unusually elongate; apex of elytra distinctly spinose opposite 3rd interval; short and wide, markedly fusiform species. Central Irian Jaya .... *curtum* Baehr

– Mandibles straight and markedly elongate; apex of elytra not spinose; either rather elongate, not markedly fusiform species, or short and wide species with almost parallel lateral borders of pronotum .... 19.

19. Basal margin of elytra not interrupted at 3rd interval; prothorax <1.8× as wide as head .... 20.

– Basal margin of elytra interrupted at 3rd interval; prothorax >2× as wide as head .... 21.

20. Rather wide, almost parallel species; pronotum >1.25× as wide as long. Central Irian Jaya .... *forceps* Darlington

– Narrow, fusiform species with evenly rounded lateral margins of pronotum; pronotum c. 1.1× as wide as long. Central Irian Jaya .... *formiceps* Darlington

21. Pronotum wider at base, ratio width of base/width of apex c. 1.8, sides more curved; elytra rather elongate. Central Irian Jaya .... *cychriceps* Darlington

– Pronotum narrower at base, ratio width of base/width of apex c. 1.65, sides more parallel; elytra rather short. Central eastern Irian Jaya .... *latum* Baehr

Fortagonum bufo Darlington

Darlington, 1952: 252, fig. 66; 1971: 317, fig. 70; Baehr 1992: 75.

This highly evolved species was recorded from the Snow Mts., formerly Western New Guinea, now Irian Jaya (Darlington 1952, 1971), and more recently from the Baliem area not far from the type locality (Baehr 1992). Recently it has been recaptured in central Irian Jaya, not far from its recorded range.

New record. 1♀, IRIAN JAYA, Jayawijaya-Pr., Jiwika, trail to Wandanku, 2240-2420m, 28.IX.1996, leg. A. Riedel (CBM).

Fortagonum spinipenne, spec. nov.

Figs 1, 4

Types. Holotype: ♀, Irian Jaya, Panai-Pr. Epomari, km 169, 900-1100 m, 18.1.1996, leg. A. Riedel (ZSM-CBM).

Diagnosis. Distinguished by presence of wings, absence of anterior supraocular seta, both pronotal setae, and anterior discal seta, rather narrow, fairly conical pronotum, narrow and elongate elytra, and markedly elongate elytral spine opposite 3rd stria.

Description

Measurements. Length: 10.5 mm; width: 4.5 mm. Ratios. Width/length of pronotum: 1.47; width base/apex of pronotum: 1.60; width pronotum/head: 1.84; width elytra/pronotum: 1.61; length/width of elytra: 1.36.

Wing-and-seta formula: +w –+ –– –++.

Colour. Glossy black. Lateral margins of pronotum faintly reddish translucent, labrum, mouth parts, antenna, and tarsi dark reddish-piceous, antenna from 3rd antennomere reddish. Lower surface black.

Head. Moderately narrow compared with prothorax. Neck rather wide, somewhat imbedded in prothorax. Eyes fairly large, laterally moderately projecting, orbits distinct, evenly curved. Clypeal suture distinct. Labrum rectangular, apex feebly concave. Mandibles elongate, straight, but not porrect. Antenna very slender and elongate, surpassing base of pronotum by about four antennomeres, median

antennomeres c. 5× as long as wide. Both palpi slender and elongate, basal palpomere of maxillary palpus thickened. Mentum with an elongate, unidentate tooth. No furrow medially of eyes, though a shallow furrow above antennal base present. Only posterior supraocular seta present, at posterior margin of eye. Clypeus and anterior part of frons with short, shallow, parallel furrow on either side, frons evenly convex, absolutely smooth. Microreticulation isodiametric, somewhat superficial. Surface glossy.

Prothorax. Comparatively narrow, somewhat conical, widest in posterior third, laterally evenly though feebly convex, strongly narrowed to apex, moderately narrowed to base. Disk slightly convex, lateral margins widely explanate though barely separated from disk. Anterior angles rather projecting, obtuse at apex. Apex regularly and deeply excised. Basal angles rectangular, at apex obtusely rounded. Base laterally straight, in middle very faintly produced. Disk convex with extremely shallow, v-shaped sulcus in apical fourth, base near basal margin with a rather deep, circular impression on either side and with a very shallow transverse impression. Median line incomplete, very fine, ending far from apex and base. Apex distinctly bordered, lateral margin and base not bordered. Both marginal setae absent. Disk impunctate. Microreticulation very fine, absent on disk, near apex and base highly superficial, isodiametric. Surface glossy.

Elytra. Rather narrow and elongate, dorsal surface markedly convex, lateral borders in middle almost straight. Preapical sinuosity extremely feeble. Widest diameter about in middle. Shoulders wide, obtusely angulate but not dentate, apex spinose with elongate spine opposite 3rd interval. Sutural angle with minute denticle. Striae rather shallow, deepened towards apex, minutely punctulate, intervals depressed. Anterior discal seta absent, both median and posterior setae situated at 2nd stria. 17 marginal setae and 1 preapical seta at 7th stria present, humeral group of marginal series consisting of 6 setae, median and apical pores not much more conspicuous than basal pores, series slightly interrupted in middle. Intervals impunctate. Microreticulation almost wanting. Surface highly glossy, rather iridescent. Wings present.

Lower surface. Prosternal process short, posteriorly slightly convex, triangular, ventrolaterally and posterolaterally bordered. Proepisternum smooth. Mesepisternum coarsely punctate. Metepisternum moderately elongate, c. 1.5× as long as wide at anterior border. Epipleura anteriorly moderately wide, rugose. Abdomen impunctate, though laterally with several fine, elongate wrinkles and shallow impressions. Microreticulation dense, isodiametric, very superficial. ♂ sternum VII unknown, ♀ sternum VII quadrisetose, apex regularly curved.

Legs. Very elongate and slender. 4th tarsomere medially faintly excised. 5th tarsomere asetose beneath. Vestiture of ♂ anterior tarsus unknwon.

♂ genitalia. Unknown.

♀ genitalia. Stylomere 2 rather elongate, little curved, with obtuse apex, with 3 fairly small ventral ensiform setae, a dorsal ensiform seta situated about in middle, and one nematiform seta in a deep furrow moderately close to apex. Apex of stylomere 1 ventrally with 7-8 setae near base of stylomere 2. Lateral plate with 8-9 setae at or near margin.

Variation. Unknown.

Distribution. Central Irian Jaya. Known only from type locality.

Collecting circumstances. Largely unknown. Presumably collected under log in rain forest of median altitude.

Etymology. The name refers to the conspicuously spinose apex of elytra.

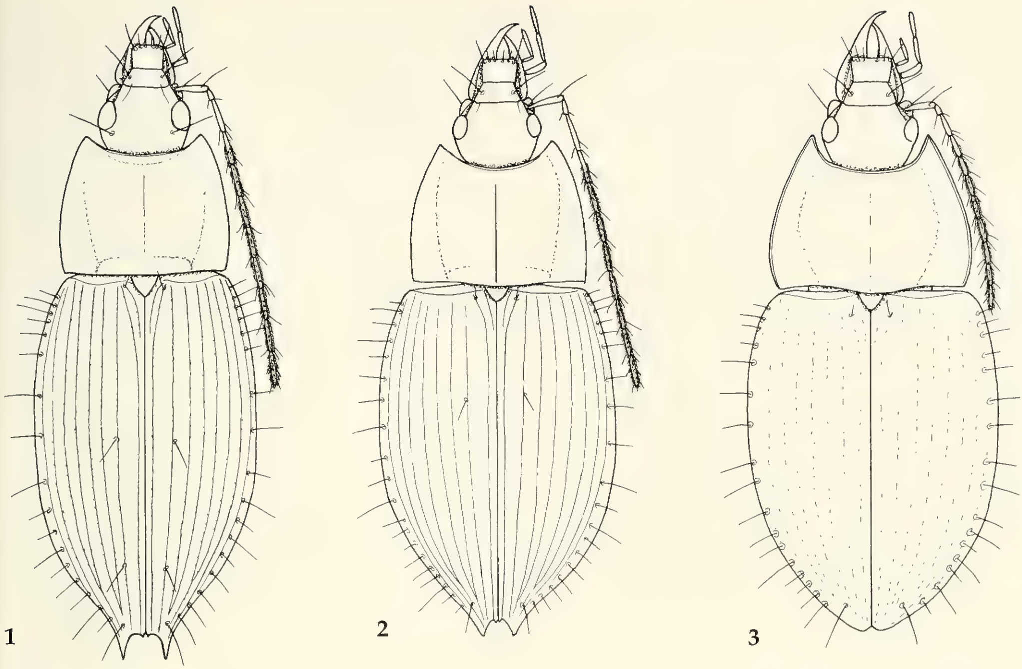
Relationships. This species is presumably most closely related to *F. subconicolle* Darlington, though is distinguished by narrower elytra and far longer elytral spines.

Fortagonum sinak, spec. nov.

Figs 2, 5

Types. Holotype: ♂, IRIAN JAYA, Panai-Pr. Sinak, 2000-2200 m, 14.-17.XII.1995, leg. A. Riedel (ZSM-CBM).

Diagnosis. Distinguished by presence of wings, absence of both supraocular setae, both pronotal seta, and anterior and posterior discal setae, moderately wide, conical pronotum with wide marginal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Figs 1-3. Habitus. **1.** *Fortagonum spinipenne*, spec. nov. ♀ holotype. **2.** *F. sinak*, spec. nov. ♂ holotype **3.** *F. laevigatum*, spec. nov. ♀ holotype. Lengths: 10.5 mm; 10.7 mm; 10.1 mm.

channel, moderately elongate, very convex elytra, and short, triangular elytral spine opposite 3rd stria.

Description

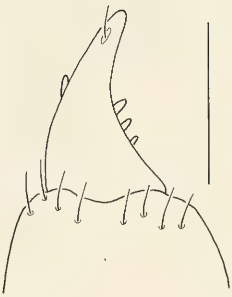
Measurements. Length: 10.7 mm; width: 4.65 mm. Ratios. Width/length of pronotum: 1.46; width base/apex of pronotum: 1.50; width pronotum/head: 1.83; width elytra/pronotum: 1.52; length/width of elytra: 1.33.

Wing-and-seta formula: +w –– –– –+–.

Colour. Glossy black. Labrum, mouth parts, antenna, and tarsi dark reddish-piceous, 1st-3rd antennomeres infuscate except for base. Lower surface black.

Head. Moderately wide compared with prothorax. Neck rather wide, somewhat imbedded in prothorax. Eyes fairly large, laterally moderately projecting, orbits distinct, evenly curved. Clypeal suture distinct. Labrum rectangular, apex feebly concave. Mandibles elongate, straight, but not porrect. Antenna slender and elongate, surpassing base of pronotum by about three antennomeres, median antennomeres c. 4× as long as wide. Both palpi slender and elongate, basal palpomere of maxillary palpus thickened. Mentum with elongate, unidentate tooth. No furrow medially of eyes, though a shallow furrow above antennal base present. Both supraocular setae absent. Clypeus and anterior part of frons with short, shallow, parallel furrow on either side, frons evenly convex, absolutely smooth. Microreticulation isodiametric, somewhat superficial. Surface glossy.

Prothorax. Moderately wide, somewhat conical, widest in posterior third, laterally feebly convex, in anterior third even almost straight, fairly narrowed to apex, moderately narrowed to base. Disk rather convex, lateral margins widely explanate, in posterior half weakly separated from disk by a shallow furrow. Anterior angles rather projecting, obtuse at apex. Apex regularly and deeply excised. Basal angles rectangular, at apex obtusely rounded. Base laterally straight, in middle very faintly produced. Disk convex with extremely shallow, v-shaped sulcus in apical fourth, base near basal margin with a rather deep, about circular impression on either side and with an extremely shallow transverse impression. Median line incomplete, very fine, ending far from apex and base. Apex distinctly bordered, lateral margin and base not bordered. Both marginal setae absent. Disk impunc-



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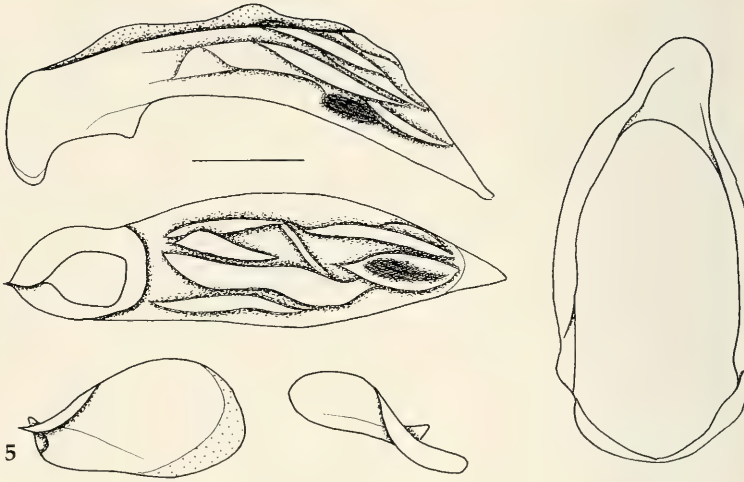

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Fig. 4. *Fortagonum spinipenne*, spec. nov. ♀ stylomere 2 and base of stylomere 1. Scale: 0.2 mm.
Fig. 5. *Fortagonum sinak*, spec. nov. ♂ aedeagus, parameres and genital ring. Scale: 0.5 mm.

tate. Microreticulation very fine, superficial on disk, near apex and base more distinct, isodiametric. Surface glossy.

Elytra. Moderately elongate, dorsal surface markedly convex, lateral borders in middle almost straight. Preapical sinuosity extremely feeble. Widest diameter about in middle. Shoulders wide, obtusely angulate but not dentate, apex dentate with short triangular spine opposite 3rd interval. Sutural angle with minute denticle. Striae deep, impunctate, intervals perceptibly convex. Anterior and posterior discal setae absent, apparent median seta situated shortly behind basal third at 2nd stria. 19-20 marginal setae and 1 preapical seta at 7th stria present, humeral group of marginal series consisting of 6 setae, median and apical pores not much more conspicuous than basal pores, series slightly interrupted in middle. Intervals impunctate. Microreticulation almost wanting. Surface highly glossy, rather iridescent. Wings present.

Lower surface. Prosternal process short, obtusely dentate behind coxae, posteriorly markedly depressed, triangular, ventrolaterally and posterolaterally bordered. Proepisternum smooth. Mesepisternum coarsely punctate. Metepisternum moderately elongate, c. 1.5 × as long as wide at anterior border. Epipleura anteriorly moderately wide, rugose. Abdomen impunctate, though laterally with several fine, elongate wrinkles and shallow impressions. Microreticulation dense, isodiametric, very superficial. ♂ sternum bisetose, in middle excised, ♀ sternum VII unknown.

Legs. Elongate and slender. 4th tarsomere medially faintly excised. 5th tarsomere asetose beneath. 1st-3rd tarsomeres of ♂ anterior tarsus biseriately squamose.

♂ genitalia. Genital ring rather parallel, at apex slightly asymmetric. Aedeagus stout, rather symmetric, lower surface faintly concave. Apex acute and rather short, with very small, upturned terminal hook. Internal sac in middle at base with a small, elongate, sclerotized plate. Left paramere rather wide, at apex evenly convex.

♀ genitalia. Unknown.

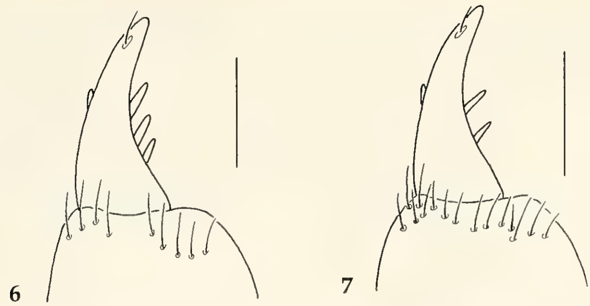
Variation. Unknown.

Distribution. Central Irian Jaya. Known only from type locality.

Collecting circumstances. Largely unknown. Presumably collected under log in rain forest of median altitude.

Etymology. The name refers to the type locality.

Relationships. According to shape and structure of aedeagus, and to structure of elytra, this species is perhaps most closely related to *A. denticulatum* Baehr, though the latter species still bears the posterior supraorbital seta.



Figs 6-7. ♀ stylomere 2 and base of stylomere 1. **6.** *Fortagonum laevigatum*, spec. nov. **7.** *F. globulipenne*, spec. nov. Scale: 0.2 mm.

Fortagonum laevigatum, spec. nov.

Figs 3, 6

Types. Holotype: ♀, IRIAN JAYA, Panai-Pr., Sinak, Tuput, ca. 2600 m, 13.XII.1995, leg. A. Riedel (ZSM-CBM).

Diagnosis. Distinguished by absence of wings, absence of both supraocular setae, both pronotal setae, and all discal setae, very wide pronotum with wide marginal channel and very obtuse posterior angles, rather short, highly convex, markedly egg-shaped elytra, very superficial elytral striae, and absence of an elytral spine.

Description

Measurements. Length: 10.1 mm; width: 5.0 mm. Ratios. Width/length of pronotum: 1.75; width base/apex of pronotum: 1.43; width pronotum/head: 2.30; width elytra/pronotum: 1.34; length/width of elytra: 1.36.

Wing-and-seta formula: –w –– –– –––.

Colour. Glossy black. Lateral margins of pronotum very faintly reddish translucent, labrum, mouth parts, tarsi, and base of tibiae dark reddish-piceous, antenna reddish though 1st-3rd antennomeres infuscate except for base. Lower surface black.

Head. Narrow compared with prothorax. Neck rather wide, deeply imbedded in prothorax. Eyes rather small, laterally fairly projecting, orbits distinct, oblique. Clypeal suture distinct. Labrum rectangular, apex feebly concave. Mandibles very elongate, straight, porrect. Antenna moderately elongate, surpassing base of pronotum by about 1½ antennomeres, median antennomeres >3× as long as wide. Both palpi elongate, basal maxillary palpomere thickened. Mentum with an elongate, unidentate tooth. No furrow medially of eyes, though a shallow furrow above antennal base present. Both supraocular setae absent. Clypeus and anterior part of frons with short, shallow, slightly curved furrow, frons evenly convex, absolutely smooth. Microreticulation isodiametric, somewhat superficial. Surface glossy.

Prothorax. Very wide, conical in anterior ¾, widest at posterior quarter, laterally straight in anterior ¾, strongly narrowed to apex, posterior quarter convex and suddenly narrowed to base. Disk rather convex, lateral margins widely explanate, separated from disk by a shallow furrow. Anterior angles far projecting, attaining at least middle of eye, narrow though obtuse at apex. Apex regularly and very deeply excised. Basal angles very obtuse, almost rounded off. Base laterally straight, in middle rather produced. Disk convex, both apical and basal sulci absent, base near basal margin with a deep, oblique impression on either side. Median line incomplete, fine, ending far from apex and base. Apex and lateral margins finely though distinctly bordered, base not bordered. Both marginal setae absent. Disk impunctate. Microreticulation very fine, on disk rather superficial, consisting of very fine transverse lines, near apex and base isodiametric and more conspicuous. Surface glossy.

Elytra. Comparatively short, markedly egg-shaped, dorsal surface highly convex, lateral borders evenly rounded to apex, though in middle but faintly convex. Preapical sinuosity absent. Widest diameter about in middle. Shoulders very wide, obtusely rounded off, apex separately rounded off, near suture slightly oblique. Striae very shallow, highly superficial, 6th and 7th striae even weaker. Striae

extremely faintly punctulate, inner four intervals faintly convex. All discal setae absent. 16 marginal setae and 1 preapical seta at 7th stria present, humeral group of marginal series consisting of 5 setae only, median and apical pores much more conspicuous than basal pores, series barely interrupted in middle. Intervals impunctate. Microreticulation extremely fine and very superficial, consisting of transverse meshes and lines. Surface highly glossy, slightly iridescent. Wings absent.

Lower surface. Prosternal process very short, not surpassing procoxae behind, posteriorly markedly depressed, triangular, ventrolaterally and posterolaterally bordered. Proepisternum smooth. Mesepisternum coarsely punctate. Metepisternum short, barely longer than wide at anterior border. Epipleura anteriorly moderately wide, rugose. Abdomen impunctate, though laterally with several fine, elongate wrinkles and shallow impressions. Microreticulation dense, isodiametric, very superficial. ♂ sternum VII unknown, ♀ sternum VII quadrisetose, apex regularly curved.

Legs. Slender and elongate. 4th tarsomere medially faintly excised. 5th tarsomere asetose beneath. Vestiture of ♂ anterior tarsus unknown.

♂ genitalia. Unknown.

♀ genitalia. Stylomere 2 elongate, little curved, with obtuse apex, with 3 large ventral ensiform setae, a dorsal ensiform seta situated about in middle, and one nematiform seta in a deep furrow fairly close to apex. Apex of stylomere 1 ventrally with c. 9 setae near base of stylomere 2. Lateral plate with 15-18 setae at or near margin.

Variation. Unknown.

Distribution. Central Irian Jaya. Known only from type locality.

Collecting circumstances. Largely unknown. Presumably collected under log in rain forest of rather elevated altitude.

Etymology. The name refers to the smooth surface of the elytra.

Relationships. This species seems to be rather unique in shape and structure. Even when the aedeagus is yet unknown, *F. laevigatum* is perhaps more closely related to *F. cychriceps* Darlington and *F. latum* Baehr than to anyone of the known species.

Fortagonum globulipenne, spec. nov.

Figs 7-9

Types. Holotype: ♂, Irian Jaya, Panai-Pr. Kamandoga, Bilai, 1900-2300 m, 3.1.1996, leg. A. Riedel (ZSM-CBM). – Paratypes: 1♀, same data (CBM); 1♂, Irian Jaya, Panai-Pr. Bilogai, 2100-2200 m, 22.-30.12.1995, leg. A. Riedel (CBM).

Diagnosis. Distinguished by absence of wings, absence of both supraocular setae, both pronotal setae, and all discal setae, moderately wide, conical pronotum with wide marginal channel and very elongate, straight anterior angles, short, highly convex elytra with deep striae and convex intervals, and absence of an elytral spine.

Description

Measurements. Length: 9.6-10.0 mm; width: 4.85-5.1 mm. Ratios. Width/length of pronotum: 1.63-1.72; width base/apex of pronotum: 1.61-1.66; width pronotum/head: 2.17-2.18; width elytra/pronotum: 1.29-1.32; length/width of elytra: 1.24-1.28.

Wing-and-seta formula: –w –– –– –––.

Colour. Glossy black. Lateral margins of pronotum faintly reddish translucent, labrum, mouth parts, antenna, and tarsi dark reddish-piceous, 1st-3rd antennomeres more or less infuscate. Lower surface black.

Head. Rather narrow compared with prothorax. Neck rather wide, deeply imbedded in prothorax. Eyes rather small, though laterally fairly projecting, orbits short, oblique. Clypeal suture distinct. Labrum rectangular, apex feebly concave. Mandibles rather elongate, straight, though not porrect. Antenna moderately elongate, surpassing base of pronotum by about one antennomere, median antennomeres >3× as long as wide. Both palpi elongate, basal maxillary palpomere thickened. Mentum with an elongate, unidentate tooth. No furrow medially of eyes, though a shallow furrow above

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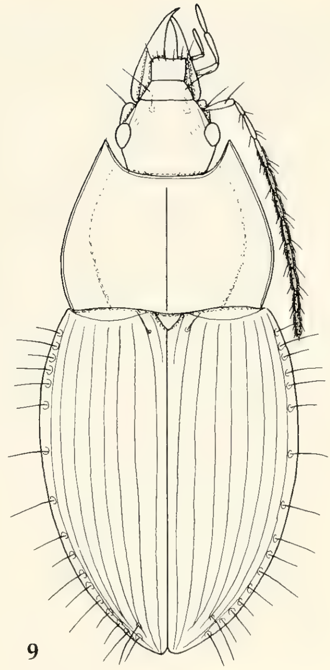

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Fig. 8. *Fortagonum globulipenne*, spec. nov. ♂ aedeagus, parameres and genital ring. Scale: 0.5 mm.
Fig. 9. *Fortagonum globulipenne*, spec. nov. ♂ holotype. Habitus. Length: 9.6 mm.

antennal base present. Both supraocular setae absent. Clypeus and anterior part of frons with short, shallow, slightly curved furrow, frons evenly convex, absolutely smooth. Microreticulation isodiametric, superficial. Surface glossy.

Prothorax. Wide, conical, widest in posterior third, laterally evenly though feebly convex, only towards apical angles straight. Strongly narrowed to apex, moderately and evenly narrowed to base. Disk evenly convex, lateral margins widely explanate, in posterior half separated fom disk by a shallow furrow. Anterior angles narrow, far projecting, acute at apex, attaining at least middle of eye, laterally straight. Apex regularly and very deeply excised. Basal angles rather obtuse, at apex obtusely rounded. Base laterally straight, in middle very faintly produced. Disk convex without anterior and posterior transverse sulci, base near basal margin with a deep, oblique impression on either side. Median line incomplete, fine, ending far from apex and base. Apex and lateral margins finely though distinctly bordered, base laterally not bordered, in middle superficially bordered. Both marginal setae absent. Disk impunctate. Microreticulation very fine, on disk highly superficial, consisting of very fine transverse lines, near apex and base isodiametric and more conspicuous. Surface glossy.

Elytra. Short, and wide, rather egg-shaped, dorsal surface highly convex, lateral borders evenly rounded to apex, though in middle but faintly convex. Preapical sinuosity barely indicated. Widest diameter about in middle. Shoulders very wide, obtusely rounded off, apex separately rounded off, near suture slightly oblique. Striae deep throughout, faintly crenulate, intervals markedly convex. All discal setae absent. 16 marginal setae and 1 preapical seta at 7th stria present, humeral group of marginal series consisting of 5 setae only, median and apical pores more conspicuous than basal pores, series slightly interrupted in middle. Intervals impunctate. Microreticulation extremely fine and very superficial, consisting of transverse meshes and lines. Surface highly glossy, slightly iridescent. Wings absent.

Lower surface. Prosternal process short, obtusely dentate behind coxae, posteriorly markedly depressed, triangular, ventrolaterally and posterolaterally bordered. Proepisternum smooth. Mesepisternum coarsely punctate. Metepisternum short, about as long as wide at anterior border. Epipleura

anteriorly moderately wide, rugose. Abdomen impunctate, though laterally with several fine, elongate wrinkles and shallow impressions. Microreticulation dense, isodiametric, very superficial. ♂ sternum bisetose, apex in middle excised, ♀ sternum VII quadrisetose, apex regularly curved.

Legs. Slender and elongate. 4th tarsomere medially faintly excised. 5th tarsomere asetose beneath. 1st-3rd tarsomeres of ♂ anterior tarsus biseriately squamose.

♂ genitalia. Genital ring rather parallel, at apex almost symmetric. Aedeagus stout, rather symmetric, lower surface almost straight. Apex acute and short, faintly upturned, but without distinct terminal hook. Internal sac at bottom in middle with a small, horseshoe-shaped, denticulate, sclerotized plate. Left paramere very wide, apex angulate.

♀ genitalia. Stylomere 2 elongate, little curved, with obtuse apex, with 2 moderately large ventral ensiform setae, a dorsal ensiform seta situated about in middle, and one nematiform seta in a deep furrow moderately close to apex. Apex of stylomere 1 ventrally with c. 12 setae near base of stylomere 2. Lateral plate with 15-16 setae at or near margin.

Variation. Very little variation noted.

Distribution. Central Irian Jaya. So far known from a very restricted area.

Collecting circumstances. Largely unknown. Presumably collected under logs in rain forest of median altitude.

Etymology. The name refers to the globose elytra.

Relationships. According to body shape and structure, and to structure of aedeagus, this species is perhaps next related to *F. bufo* Darlington, but is distinguished from the latter species by the straight (not concave) lateral border of the apical prothoracic angle, and by the presence of only one sclerotized plate (not two) in the internal sac of the aedeagus.

Acknowledgements

My thanks are due to Mr. A. Riedel, München, for kindly submitting the specimens for identification.

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Darlington, P. J. Jr. 1952. The carabid beetles of New Guinea. Part 2. The Agonini. – Bull. Mus. comp. Zool. **107**: 89-252

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Alphabetical checklist of the species of the genus *Fortagonum*

acuticolle Baehr, 1995
antecessor Darlington, 1971
bigemum (Darlington, 1971)
bisetosiceps Baehr, 1995
bufo Darlington, 1952
curtum Baehr, 1992
cychriceps Darlington, 1952
denticulatum Baehr, 1995
depressum Baehr, 1995
forceps Darlington, 1952
formiceps Darlington, 1971
fortellum Darlington, 1951
globulipenne, spec. nov.
laevigatum, spec. nov.
latum Baehr, 1995
okapa Darlington, 1971
oodinum Darlington, 1971
sinak, spec. nov.
spinipenne, spec. nov.
spinosum Baehr, 1995
subconicolle (Darlington, 1971)
unipunctatum Baehr, 1995

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A further new species of the genus *Mecyclothorax* Sharp from western New Guinea

(Insecta, Coleoptera, Carabidae, Psydrinae)

Martin Baehr

Baehr, M. (1998): A further new species of the genus *Mecyclothorax* Sharp from western New Guinea (Insecta, Coleoptera, Carabidae, Psydrinae). – Spixiana **21/1:** 21-24

Mecyclothory bilaianus, spec. nov. from central Irian Jaya, western New Guinea is described. It belongs to a group of species distinguished by small size, globose elytra, absence of the posterior lateral seta of prothorax and occurrence in montane rain forest of median altitudes.

Dr. Martin Baehr, Zoologische Staatssammlung, Münchhausenstr. 21, D-81247 München, Germany.

In a sample of carabid beetles collected by Mr. A. Riedel, München, during one of his recent trips to Irian Jaya, a further new species of *Mecyclothorax* was detected that is described herein.

The genus *Mecyclothorax* has recently turned out as being rather numerous and diverse in the highlands of New Guinea (Baehr 1995). Therefore, it is not too surprising to find a further new species in central Irian Jaya that is rather closely related to *M. riedeli* Baehr, *M. jiwikae* Baehr, and *M. langdae* Baehr described recently (Baehr 1992, 1995) from collectings made by A. Riedel in different parts of Irian Jaya.

Mecyclothorax bilaianus, spec. nov.

Figs 1, 2

Types. Holotype: ♂, IRIAN JAYA, Panai-Pr. Kamandoga, Bilai, 1900-2300 m, 3.1.1996, leg. A. Riedel (Zoologische Staatssammlung, as permanant loan in working collection of author).

Diagnosis. Small, iridescent black species, distinguished by absence of the posterior lateral pronotal seta, obtuse basal angle and impunctate basal part of pronotum, short, not oviform elytra with markedly punctate inner and almost reduced outer striae, and glossy, though not iridescent surface. It is closely related to *M. riedeli* Baehr, *M. jiwikae* Baehr, and *M. langdae* Baehr, but is distinguished from all three species by the conspicuously falciform apex of the aedeagus.

Description

Measurements. Length: 4.0 mm; width: 1.7 mm. Ratios. Width head/prothorax: 0.65; width/length of prothorax: 1.17; width base/apex of prothorax: 1.01; with elytra/prothorax: 1.45; length/widthof elytra: 1.42.

Colour. Black, mandibles, palpi, antennae, and legs reddish. Lower surface black, elytral epipleurae reddish.

Head. Rather narrow in relation to prothorax. Eyes comparatively large though depressed, orbits small, oblique, c. ⅕ of length of eye. Clypeal suture well impressed. Frontal furrows slightly sinuate,

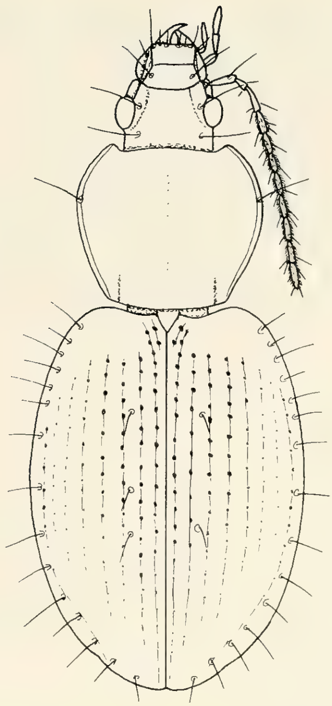

Fig. 1. *Mecyclothorax bilaianus*, spec. nov. Habitus. Length: 4 mm.

very oblique, deep, prolonged just medially of eyes almost behind posterior supraocular seta. Labrum transverse, truncate, 6-setose. Mandibles moderately elongate, apically suddenly curved. Mentum with distinct, apically rounded tooth. Antenna short, barely surpassing posterior border of pronotum, median antennomeres c. 1.5 x as long as wide. Posterior supraorbital seta situated well behind posterior border of eye. Frons with shallow, oblong median groove. Surface impunctate, without microreticulation, glossy.

Pronotum. Large, wide, circular, considerably wider than long, in middle rather depressed, laterally evenly curved, without any excision in front of the basal angles. Widest diameter slightly in front of middle. Base as wide as apex. Apex straight, apical angles feebly projecting, rounded off. Base slightly convex, laterally rather oblique. Basal angles perceptible though very obtuse. Marginal channel narrow throughout, barely widened near basal angles, base and apex not margined. V-shaped anterior sulcus only laterally perceptible. Median line distinctly impressed, anteriorly slightly, posteriorly much abbreviated. Basal grooves linear, elongate, straight. Basal area not explanate, on same level with disk, almost impunctate. Anterior marginal seta situated slightly in front of middle, slightly removed from lateral margin, posterior marginal seta absent. Surface impunctate, without any microreticulation, highly glossy.

Elytra. Short and wide, dorsally markedly convex, widest diameter in middle. Shoulders obtusely rounded off, lateral margin evenly curved. Basal margin strong, oblique, slightly sinuate, connected to scutellary striole. Striae except for sutural stria much abbreviated at shoulder, all striae except for inner two also abbreviated at apex. Sutural stria fairly impressed, 2[nd]-4[th] striae slightly impressed, very coarsely punctate, 5[th] and 6[th] striae not impressed, though punctate, 7[th] striae barely perceptible. Scutellary striole fairly elongate, situated mediad of 1[st] interval. Marginal channel narrow. 3rd interval with 2-3 setiferous punctures in centre of interval, anterior puncture in basal fourth, posterior puncture in middle, on left elytron an additional puncture slightly behind middle. Punctures rather inconspicuous, setae extremely short. Near apex with two setiferous punctures outside 3[rd] stria in a deep, elongate striole marking the prolongation of 7[th] stria. Marginal pores inconspicuous, about 13 in a row that is slightly interrupted in middle. Intervals impunctate, without any traces of microreticulation.

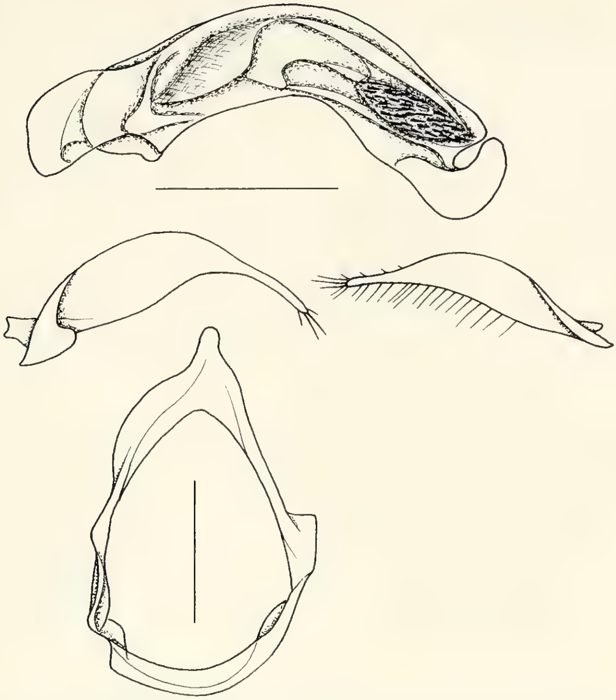

Fig. 2. *Mecyclothorax bilaianus*, spec. nov. ♂ genitalia, aedeagus, parameres, and geital ring. Scales: 0.5 mm.

Surface highly glossy, though not iridescent. Inner wings absent.

Lower surface. Impunctate. Metepisternum about as long as wide. Sternum VII in ♂ 2-setose.

Legs. Without striking features. Three basal tarsomeres of male anterior tarsus expanded and squamose.

♂ genitalia. Genital ring odd shaped, with conspicuously incurved lateral flanges, markedly asymmetric. Aedeagus moderately elongate, suddenly curved, apex not twisted, markedly compressed, foliaceous, conspicuously falciform, strongly sclerotized, on right side less compressed, less laminate, and with a sclerotized rim. Orifice almost completely situated on right side. Internal sac with a weakly toothed apical part and with some folding. Right paramere rather short and wide, at apex c. 5 fairly elongate apical setae, two shorter subapical setae, some short hairs on upper rim, and many thin and rather elongate hairs along lower margin. Left paramere more elongate, basally moderately wide, with narrow, fairly elongate, strongly curved apex that bears two elongate and two shorter apical setae.

♀ genitalia. Unknown.

Variation. Unknown.

Distribution. Bilai area, central Irian Jaya. Known only from type locality.

Collecting circumstances. Largely unknown. Presumably collected by sieving litter from or under logs in montane rain forest of median altitude.

Etymology. The name refers to the type locality.

Recognition

When using my key to the New Guinean species (Baehr 1995) the new species would key out at couplet 7. From there, the key should be altered as following:

7. Smaller and shorter species, length <3.8 mm, ratio l/w of elytra <1.37; basal angles of pronotum almost rounded off; anterior transverse sulcus of pronotum weak; aedeagus elongate, markedly

curved, with sclerotized apical plate (Baehr 1995, fig. 10). Jiwika area, central Irian Jaya, at 2300 m .... *jiwikae* Baehr

– Larger and more elongate species, length >4.0 mm, ratio l/w of elytra >1.42; basal angles of pronotum distinct, though obtuse; aedeagus different, less evenly curved, either stouter, or with two sclerotized rods in internal sac, or with conspicuously falciform apex (Fig. 2) .... 8.

8. Smaller and shorter species, length <4.4 mm, ratio l/w of elytra 1.42-1.44; colour glossy black; striae of elytra less impressed, intervals less convex; median segments of antenna shorter, < 2 x as long as wide; aedeagus markedly curved down, either with slightly upturned apex and two sclerotized rods within internal sac, or with conspicuously falciform apex (Fig. 2) .... 9.

– Larger and more elongate species, length 4.6 mm, ratio l/w of elytra 1.52; colour reddish, with slightly darker head; striae of elytra more deeply impressed, intervals distinctly convex; median segments of antenna longer, c. 2.5× as long as wide; aedeagus less distinctly curved down, apex simply curved down, internal sac without sclotized rods (Baehr 1995, fig. 11). Langda area, eastern central Irian Jaya, at 2300 m .... *langdae* Baehr

9. Striae of elytra less coarsely punctate; microreticulation of elytra superficial though present; apex of aedeagus slightly curved up, internal sac with two sclerotized rods (see Baehr 1992, fig. 2). Kangine area, Baliem Valley, central Irian Jaya, at 1900 m .... *riedeli* Baehr

– Striae of elytra coarsely punctate; microreticulation of elytra totally absent; apex of aedeagus markedly falciform, internal sac without sclerotized rods (Fig. 2). Bilai area, central Irian Jaya, at 1900-2300 m .... *bilaianus* Baehr

Remarks

The new species belongs to a group of species that are distinguished by rather small size, globose elytra, absence of posterior lateral seta on prothorax, obtuse basal angles of prothorax, and occurence in ground litter of rain forest in median altitude. It is distinguished from all described New Guinean species of this group by its strange aedeagus that bears a heavily sclerotized, remarkably falciform apex.

Acknowledgements

My thanks are due to Mr. A. Riedel, München, for kindly submitting the specimens for identification.

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New data on Chrysomelidae of Nepal

(Insecta, Coleoptera)

L. N. Medvedev and **E. Sprecher-Uebersax**

Medvedev, L. N. & E. Sprecher-Uebersax (1998): New data on Chrysomelidae of Nepal (Insecta, Coleoptera). – Spixiana **21/1:** 25-42

Recently studied material from Nepal has resulted a new genus *Sphenorella* and 7 new species (*Oreomela annapurnae, Apophylia brancuccii, Japonitata diformis, Monolepta impressicollis, Doryscus niger, Paraplotes nepalensis, Dercetina nepalica*) as well as 56 species firstly recorded for Nepal. 7 new synonymies, 1 new homonymy, 2 redescriptions and 7 rectifications are proposed. Keys for Nepalese *Apophylia*, Oriental *Euphitrea micans*-group and one to divide *Paridea octomaculata* from *P. tetraspilota* are given.

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Introduction

As a part of our project "Catalogue of Chrysomelidae from Nepal" we propose the next part of taxonomical investigation on leaf beetles from Nepal. Our studies based mostly on the material of the Natural History Museum in Basel, but also on the collection of Staatliches Museum für Naturkunde Stuttgart. In the Natural History Museum of Basel the material of Nepalese leaf beetles is very rich and therefore gives us the chance of large investigations. In this article descriptions of new taxa, synonymical notes, nomenclature changes as well as a large list of species firstly recorded for Nepal and keys for a few genera or species group are given. The material is deposited in the collections mentioned below. The following abbreviations are used:

NHMB	Naturhistorisches Museum, Basel
SMNS	Staatliches Museum für Naturkunde, Stuttgart
LM	Collection of L. Medvedev, Moscow

List of species

Subfamily Eumolpinae

Nodina robusta Jacoby

N. crassipes Jacoby, 1908 and *N. major* Kimoto & Gressitt, 1982 are new synonyms of this species, which has rather variable colour of legs, from entirely fulvous to strongly darkened with fulvous apices of tibiae and tarsi.

Subfamily Chrysomelinae

Agrosteomela fallaciosa Stal

Material: 1 ex., Mt. Everest.

New for Nepal, was known from Sikkim and Assam.

Phrathora abdominalis Baly

Material: 1♀, Langtang National Park, Kyanjin Gompa, 4000 m, 12. V. 1988, leg. S. Bily.

New for Nepal, was known from North India.

Gonioctena inconditus Weise

Material: 1♂, East Nepal, Arun Valley, Num-Chichila, 1500-1900 m, 17. VI. 1980, leg. C. Holzschuh.

New for Nepal, was known from Malaysia.

Oreomela (s. str.) *annapurnae*, spec. nov.

Fig. 1

Types. Holotype: ♂, Nepal, Annapurna Mts. (Everest) (LM).

Diagnosis. Near *O. indica* Jacoby, 1896, differs in colour, evenly rounded (not cordiform) sides of prothorax, and structure of aedeagus with well developed and acute apical process.

Description

Upperside and legs dark bronze, antennae and underside practically black.Body elongate, widened posteriorly, broadly rounded at apex. Head much more narrow than prothorax, sparsely punctate and extremely finely shagreened, with deep transverse groove dividing frons and clypeus. Antennae with segment 2 subglobose, segment 3 elongate, about 1.5 times as long as 2nd and slightly longer as 4th; next segment elongate, subequal to 4th. Prothorax 1.6 times as wide as long, with maximal width in middle, sides evenly rounded, anterior angles rounded, posterior angles obtuse, surface moderately convex, shagreened and not densely uniformly punctate; all punctures of the same size. Scutellum very short, triangular, densely shagreened. Elytra ovate, 1.25 times as long as wide, with maximal width just behind middle, surface moderately convex, finely and sparsely punctate, punctures distinctly smaller than on prothorax, interspaces shining. Fore tarsi of ♂ not widened, pubescent below. Claws simple. Aedeagus (Fig. 1) longitudinally concave on underside, especially on apical process.

Length: 5.5 mm.

Oreomela (s. str.) *himalayensis nepalica*, subspec. nov.

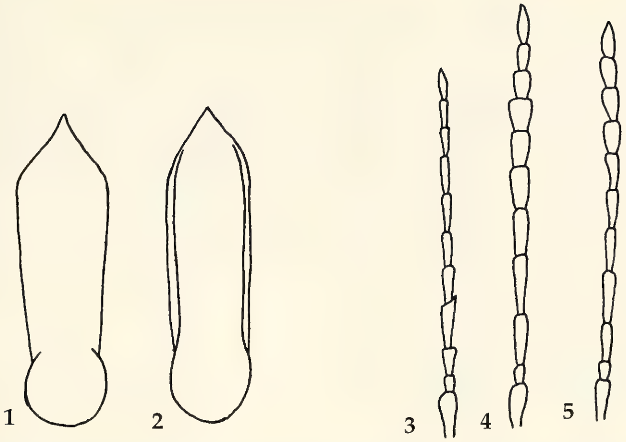
Fig. 2

Types. Holotype: ♂, Nepal, Prov. Karnali, Distr. Dolpa, Kagmara Lekh Garpung Khola, Hochplateau, 4100 m, 12.V.1995, leg. A. Weigel (LM).

Diagnosis. This subspecies is identical with nominative form in structure of aedeagus, but differs in having distinct metallic colour, more finely punctured prothorax and very shining upperside.

Description

Upperside aeneous green, antennae, legs and underside black. Body elongate, widened posteriorly. Head finely and sparsely punctate, shining. Antennae with segment 3 distinctly longer than 2nd or 4th. Prothorax 1.7 times as wide as long, feebly cordiform, with obtuse hind angles; surface shining, finely



Figs 1, 2. *Oreomela*, aedeagus ventral. **1.** *O. annapurnae*, spec. nov. **2.** *O. himalayensis nepalica*, subspec. nov. **Figs 3-5.** *Apophylia*, antennae of ♂. **3.** *A. brancuccii*, spec. nov. **4.** *A. aeruginosa* Hope. **5.** *A. samoderzhenkovi* Medvedev.

punctate and shagreened. Scutellum short, triangular, shining. Elytra 1.3 times as long as wide, with maximal width in middle, surface shining, finely punctate, more or less wrinkled among punctures. Fore tarsi of ♂ not widened. Aedeagus (fig. 2) longitudinally concave on underside, especially in apical part, with membranous apical third and simple rounded triangular apex.

Length: 5.2 mm.

Subfamily Galerucinae

Apophylia aeruginosa (Hope)

Figs 4, 15

We have at our disposal 3♂♂ from Nepal with a specific structure of abdomen and rather moderate size, but in all other characters fully identical with *A. aeruginosa* Hope. Maulik (1936) in his description of *A. aeruginosa* mentions nothing about spines on abdomen, but very possibly he overlooked this character (as in the case of *A. nilakrishna* Maulik). Because of this we propose a description of the ♂ which we accept for *A. aeruginosa* Hope.

Redecription

Black, basal half of antennae and legs fulvous, elytra metallic green or bluish green, tarsi more or less darkened.

Anterior part of head, including frontal tubercles practically smooth and shining, hind part very densely punctate, dull. Antennae (Fig. 4) about ⅔ of body lenght, in ♂ with thickened preapical and shortened apical segments. Prothorax 1.7-1.8 times as wide as long, with maximal width in anterior third, anterior margin practically not elevated and not incised in middle, hind margin feebly concave, surface with shallow impression on middle line and groove on each side, finely and densely punctate. Elytra very densely punctate. Segment 1 of anterior and mid tarsi of ♂ very narrow, elongate and curved. Abdominal sternites 1 and 2 of ♂ with two sharp teeth each on hind margin (Fig. 15), last sternite with small groove before apex. Aedeagus symmetrical, parallel-sided, with narrowed apical third (Fig. 6)

Length: 6.3-6.7 mm.

Material used for description: East Nepal, Dhawalagiri, Myagdi Distr., Ghara Khola, Shikka-Tatopani, 1100-2000 m (J. Probst); Nepal, Bagmati, Sindhupalchok; Gangiwal-Parahang, 1700-2500 m, 8.VI.1989 (M. Brancucci); 1♂ without head and prothorax, same region, Sarmatang-Gangiwal, 2500 m, 5.VI.1969 (M. Brancucci).

Apophylia brancuccii Medvedev, spec. nov.

Fig. 3

Types. Holotype: ♂, East Nepal, Mechi, Dobhan-Phulvari, 800-1200 m, 8.VI.1985, leg. M. Brancucci (NHMB). – Paratypes: 1 ex., E. Nepal, leg. M. Brancucci: same locality; 10 ex., Arun Valley, Pharicot, 550 m, 13.VI.1983; 2 ex., Koshi, Dharan, 18.VI.1985; 1 ex.,Koshi, Simraghat-Lumbughat, 450 m, 14.VI.1985; 1 ex., Arun Valley, Tumlingtar, 450 m, 26.V.1983; 4 ex., Hile, Arun R., 200-300 m, 26.V.1983; 3 ex., East Nepal, Arun Valley, Mongmaya-Surtibari, 400 m, 1.VI.1992, leg. J. & J. Probst (NHMB, 2 in LM).

Diagnosis. Near *A. metallica* Jacoby, 1904, poorly known species from South India, differs by bicolorous head and unicolorous elytra. From Nepalese species it differs by characters indicated in the key given below.

Description

Fulvous; head behind frontal tubercles and middle of mesosternum black, apical half of antennae darkened, elytra metallic green. Head roughly and densely punctate. Antennae thin, with elongate segments (Fig. 3). Prothorax twice as broad as long, with maximal width in anterior third, anterior margin elevated, incised in middle, hind margin concave, surface with impressed middle line and large shallow groove on each side, densely punctate. Elytra very densely punctate. Segment 1 of anterior and mid tarsi not enlarged in ♂. Aedeagus (Fig. 7) lanceolate, with triangular acute apex, slightly asymmetrical.

Length 4.8-5.7 mm.

Key to *Apophylia* of Nepal

1. Prothorax fulvous, sometimes with black spots. .... 2.
– Prothorax black. .... 5.

2. Prothorax with black spots. .... 3.
– Prothorax without black spots. Head bicolorous, legs and underside except metasternum fulvous. Length 4.8-5.7 mm .... *brancuccii*, spec. nov.

3. Prothorax with 1 black spot. .... 4.
– Prothorax with 3 black spots. Head fulvous with black vertex. Legs fulvous. Elytra metallic green. Aedeagus see fig. 9. Length 5.5-6.5 mm .... *crotchi* Jacoby

4. Antennae and legs entirely or mostly fulvous. Head bicolorous. Elytra metallic green. Length 4.7 mm .... *sericea* Fabricius
– Antennae and legs entirely or mostly black. Head black. Elytra usually bronze or dark green. Length 6.5-7.5 mm .... *maculata* Kimoto

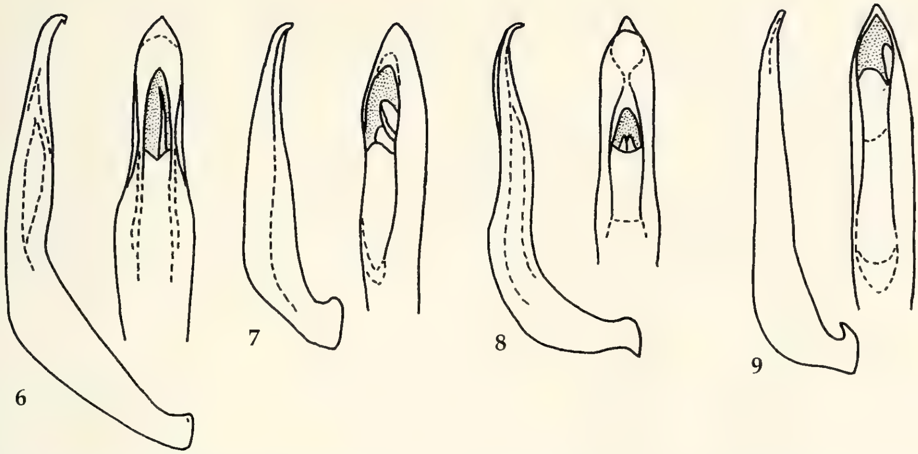
5. Head bicolorous. Margins of prothorax often fulvous. Legs fulvous. .... 6.
– Head entirely black. .... 7.

6. Elytra metallic green. Antennae of ♂ see fig. 5. Aedeagus lanceolate, asymmetrical, with very acute apex. Length 4.8-5.5 mm .... *samoderzhenkovi* Medvedev
– Elytra practically black. Length 6-7.3 mm. Possibly a dark form of preceding species .... sp. A

7. Legs black, knees sometimes fulvous. .... 8.
– Legs fulvous, tarsi and apices of femora sometimes darkened. .... 10.

8. ♂ antennal segments 7-8 not thickened, about 3 times as long as wide. Body smaller. .... 9.
– ♂ antennal segments 7-8 thickened, about 1.5 times as long as wide; abdominal segments 1 and 2 with two teeth each. Body larger, 7-7.8 mm .... *nilakrishna* Maulik

9. Frontal tubercles smooth. Elytra green. ♂ abdominal segment 1 with 2 hairy brushes. Aedeagus not narrowed in apical part, extreme apex short triangular, curved downwards (Fig. 8). Length 5.1-5.8 mm .... *schawalleri* Medvedev



Figs 6-9. *Apophylia*, aedeagus lateral and dorsal. **6.** *A. aeruginosa* Hope. **7.** *A. brancuccii*, spec. nov. **8.** *A. schawalleri* Medvedev. **9.** *A. crotchi* Jacoby.

– Frontal tubercles usually shagreened. Elytra dark violaceous or green with cupreous suture. ♂ abdomen simple, aedeagus cuneiform with apex not curved downwards. Length 4.1-5.9 mm . ... *himalayana* Medvedev

10. Elytra green. ♂ antennal segments 7-9 thickened (Fig. 2).Abdominal segments 1 and 2 with two teeth each. Aedeagus see fig. 6. Length 6.3-6.7 mm .... *aeruginosa* Hope

– Elytra green with golden suture. Body small, 5 mm. Unclear species, very possibly identical with preceding one .... *assamensis* Jacoby

Sastroides dohertii Maulik

Material: 1 ex., Koshi, Chauki, 2700 m, 2.VI.1985 (M. Brancucci); 1 ex., Ganesh Himal, Somathang, 3270 m, 15.VI.1993 (M. Hroblay).

New for Nepal, was known from Burma and Laos.

Mimastracella pubicollis Samoderzhenkov

Material: 2 ex., Arun Valley, Lamobagar Ghola, 1400 m, 28.-31.V.1980 (C. Holzschuh).

New for Nepal, was described from Vietnam.

Mimagitocera flava (Jacoby)

Material: 1 ex., Taplejung Distr., Gunsa Khola, 2400-2600 m, 12.IX.1983 (J. Martens & W. Schawaller).

New for Nepal, was known from Assam.

Trichocerophysa latifascia Gressitt & Kimoto

Material: 1 ex., Arun Valley, Lamobagar Gola, 1400 m, 8.-14.VI.1983 (M. Brancucci).

New for Nepal, was known from China.

Agetocera lobicornis Baly

Material: 2 ex., "Himalaya, Mt. Everest".

New for Nepal, was known from North India.

Aulacophora carinicauda Chen & Kung

Material: 1♂, Gorkha Distr., Ghorka-Khanckok, 1700-2300 m, 22.V.1990, leg. J. Probst.

New for Nepal, was known from South China and Vietnam.

Cerophysella viridipennis Allard

Material: 1♂, 1♀, Arun Valley, Lamobagar Ghola, 1400 m, 8-14.VI.1983 (M. Brancucci); 1♀, Arun Valley, Mure, 2000 m, 2.-8.VI.1983 (M. Brancucci); 1♂, Thamur Valley, Dhankuta-Bile, 1150-2000 m, 24.-25.V.1983 (M. Brancucci).

New for Nepal, was known from Indochina.

Genus *Taumacera* Thunberg

The genus *Oedicerus* Kollar & Redtenbacher, 1848 is a new synonym of *Taumacera*. A typical *Taumacera* has no enlarged antennal segments in ♂, or segments 3-7 are modified; in the subgenus *Cerophysa* Chevrolat, 1837 segments 5-6 or more often segment 8 are enlarged. In *Oedicerus* ♂♂ have modified 5th and 6th segments, Therefore we can reduce *Oedicerus* to a full synonym of *Taumacera*, because all differences are only in secondary sexual characters.

Taumacera monstrosa Jacoby

Material: 1 ex., Arun Valley, Tumlingtar-Khandbari, 450-1100 m, 27.V.1983 (M. Brancucci; 1 ex., Arun Valley, Khandbari-Bhotebas, 950-1850 m, 5.VI.1992, leg. J. Probst.

New for Nepal, was known from Burma.

Taumacera mandarensis Jacoby

The species is rather variable: prothorax entirely red or with black bilobed spot in middle, rarely entirely black; antennae black or with red basal segment; head more or less darkened, legs from fulvous to red. Form of aedeagus and structure of ♂ antennae are identical in all these colour variations. *T. andrewesi* Jacoby, 1904 is very possibly identical with this species.

Phyllobrotica komiyai Takizawa

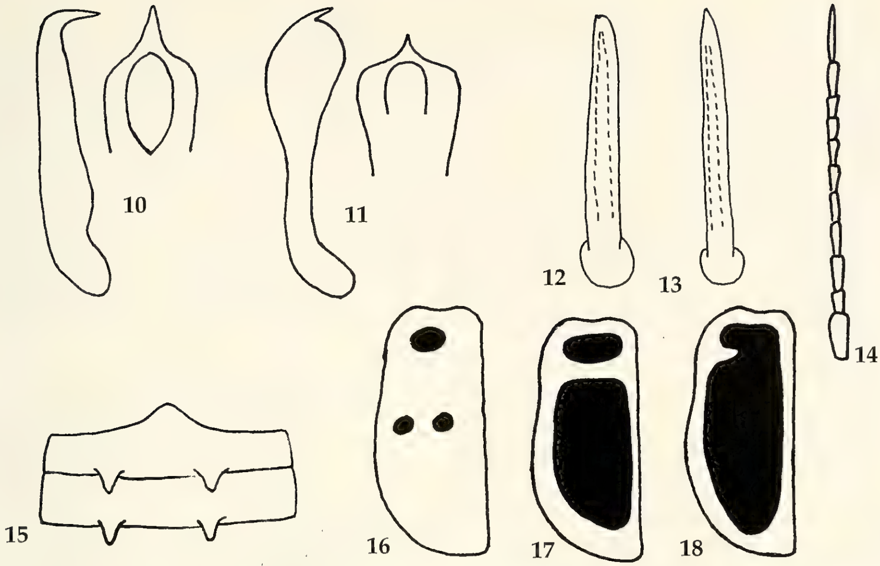
Material: 1 ex., Dolakha, Tama Kola, 850-1100 m, 24.-29.V.1989 (M. Brancucci).

New for Nepal, was known from West Bengal.

Liroetis apicicornis Jacoby

Material: 1 ex., Arun Valley, Num, 1550 m, 5.-6.VI.1983 (M. Brancucci); 1 ex., Bagmati, Sindhupalchok, 2500 m, 6.-7.VI.1989 (M. Brancucci).

New for Nepal, was known from South India.



Figs 10-11. *Paridea*, aedeagus lateral and dorsal. **10.** *P. tetraspilota* Hope. **11.** *P. octomaculata* Baly.
Figs 12-13. *Doryscus*, aedeagus ventral. **12.** *D. niger*, spec. nov. **13.** *D. testaceus* Jacoby.
Fig. 14. *Paraplotes nepalensis*, spec. nov, antenna.
Fig. 15. *Apophylia aeruginosa* Hope, spines on abdominal sternites 1 and 2.
Figs 16-18. *Sphenorella maculata* (Kimoto & Takizawa), elytral pattern. **16.** From Manegero. **17.** From Phulchoki. **18.** From Chautara.

Mimastra nitida Maulik

Material: 2 ex., Bagmati, Nuwakot, 2300 m, 15.VI.1989 (M. Brancucci).

New for Nepal, was known from North India.

Japonitata diformis, spec. nov.

Types. Holotype: ♀, East Nepal, Arun Valley, Mure, 2000 m, 2.-8.VI.1983 (M. Brancucci), spotted specimen (NHMB). – Paratypes: 6♀♀, same locality (NHMB, 2 in LM).

Diagnosis. We place this species in *Japonitata*, although it has closed anterior coxal cavities, because all other characters fully correspond to this genus. It resembles more or less *J. eberti* Kimoto, 1970, but differs immediately in having only one ridge on elytra.

Description
Fulvous, antennae dark brown except one or two basal segments, elytra often with two large black spots: one behind basal convexity, another behind middle. Head shining, impunctate; interantennal space narrow and carinate, frontal tubercles delimited behind with transverse groove. Antennae reach behind middle of elytra, segment 3 distinctly longer than 2, segment 4 a little longer than 3, next segments subequal to 4. Prothorax 1.8 times as wide as long, with maximal width before middle, sides feebly rounded, anterior margin feebly concave, basal margin straight, with oblique emargination at hind angles, surface shining, impunctate, with large shallow impression on each side. Elytra with high humeral tubercle and sharp lateral ridge, dividing vertical part of elytra and distinct to apical slope, basal convexity distinct, surface smooth, shining, impunctate, but with transparent, more or less darkened dots. Anterior coxal cavities narrowly closed.

Length: 4.8-5.8 mm.

Paridea (Semacia) lateralis Medvedev & Samoderzhenkov

Material: 2♂♂, 1♀, West Nepal, Chitre, Ghar Khola, 2400 m, 26.-31.V.1984 (C. Rai) (NHMB, LM).

New for Nepal, was described from Vietnam.

Paridea octomaculata (Baly)

Fig. 11

This very usual species is rather variable, the elytral spots are sometimes enlarged and more or less united together. In such case the species resembles very much another species, *P. tetraspilota* (Hope, 1831). However, they differ well in structure of aedeagus as follows:

Key to *Paridea octomaculata* and *tetraspilota*

1. Aedeagus rather straight and thin in lateral view, apex rounded, with long apical process, curved downwards under right angle. Underside without grooves (Fig.10) .... *tetraspilota* Hope
– Aedeagus thickened in middle and curved in lateral view, apex truncate with short apical process, rather feebly curved downwards; underside with groove before apex and another along the middle (Fig. 11) .... *octomaculata* Baly

Cneorane birmanica Jacoby

Material: 1 ex., Arun Valley, Num, 1500 m, 5.-6.VI.1983 (M. Brancucci).

New for Nepal, was known from Burma.

Cneorane dohertii Maulik

Material: 1 ex., Bagmati, Nuwakot, Pati Bhanjyang, 1900 m, 16.-18.VI.1989 (M. Brancucci); 1 ex., Godavari, 1500-2500 m, 1.VII.1987 (C. Rai).

New for Nepal, was known from Assam.

Morphosphaera prava Maulik

Material: 1 ex., Bagmati, Sindhupalchok, 1700-2500 m, 8.VI.1989 (M. Brancucci).

New for Nepal, was known from Assam and Burma.

Genus *Calomicrus* Stephens

The genus *Charaea* Baly, 1878 is a new synonym of *Calomicrus*. All characters given in the original description correspond fully with the latter genus.

Calomicrus balyi, nom. nov.

= *Charaea flaviventris* Baly, 1878 (homonymy with *Calomicrus flaviventris* Motschulsky, 1860).

Material: 12 ex., Kali-G. Khola, Kalopani, 1600-2500 m, 26.VI.1986 (C. Holzschuh); 6 ex., Mure-Num, 1500-2000 m, 4.-7.VI.1983 (M. Brancucci).

New for Nepal, was known from Punjab.

Monolepta labiata Jacoby

Material: 2 ex., Dhaulagiri, Kali-G. Khola, 1600 m, 18.VI.1986 (C. Holzschuh).

New for Nepal, was known from Bengal.

Monolepta rufa Takizawa

Material: 1 ex., Modi Khola, Randrung, 1100-1800 m, 3.-6.VI.1984 (C. Holzschuh).

Monolepta impressicollis, spec. nov. (det. by L. Medvedev)

Types. Holotype: ♂, Assam, Kasiranga (LM).

Diagnosis. Resembles *M. bimaculipennis* Kimoto, 1970, but prothorax with very distinct depressions and more closely punctate, head bicolorous, elytra with clearly transverse fulvous band (not rounded spot).

Description

Black; anterior part of head, including frontal tubercles, 3 basal segments of antennae, prothorax, broad transverse band in the middle of elytra and legs fulvous; tibiae and tarsi darkened. Body elongate, flattened. Head with deep transverse groove behind frontal tubercles, vertex punctate and finely wrinkled. Antennal segments 2 and 3 subequal, segment 4 almost as long as two preceding together, next segments subequal or slightly shorter than 4th. Prothorax 1.4 times as wide as long, lateral margins almost straight, hind angles distinct, almost rectangular, anterior and posterior margins arcuate, surface with distinct depression on each side just behind middle, densely punctate. Elytra 1.7 times as long as wide, very densely punctate, with sparse hairs, mostly on apical slope. Segment 1 of posterior tarsus about twice as long as next segments combined.

Length: 4.2 mm.

Monolepta bimaculicollis Jacoby

Material: 1 ex., Lamobagar Khola, 1400 m, 8.-14.VI.1983 (M. Brancucci).

New for Nepal, was known from South India.

Paleosepharia tomokunii Kimoto & Takizawa

Material: 1 ex., Godavari, 1500 m, 21.-27.V.1989 (M. Brancucci).

This rare species was described from the Nepal by Kimoto & Takizawa, 1983.

Paleosepharia pokharensis Kimoto (comb. nov.)

This species, described as *Monolepta*, is transferred to the genus *Paleosepharia; P. costata* Takizawa & Basu, 1987 is a new synonym of this species.

Sinoluperoides marginalis Kimoto

Material: 2 ex., Kathmandu Valley, Godawari, 1500 m, 17.V.1983 and 31.V.1987 (M. Brancucci).

New for Nepal, was known from Vietnam.

Doryscus niger, spec. nov.
Fig. 12

Types. Holotype: ♂, West Nepal, Pothara-Landrung, 1600-1900 m, 7.V.1984, C. Holzschuh (NHMB).

Paratypes: 1 ex., same locality; 2 ex., Central Nepal, Bagmati, Sindhupalchok, Gangjwal, 2500 m, 6.-7.VI.1989, C. Holzschuh (NHMB, LM); 1♀, Bagmati, Sindhupalchok, Dubhachaur-Sarmatang, 1600-2500 m, 3.VI.1989, M. Brancucci (NHMB); 1 ex., Myagdi Distr., Myagdi Khola N Boghara, 1800-2000 m, 21.V.1995, Martens & Schawaller (SMNS).

Diagnosis. Very near to the single known species of the genus, *D. testaceus* Jacoby, 1887, and might be only a dark variation of the latter, but differs in obtuse apex of aedeagus (not pointed as in *D. testaceus*, fig. 13), black body, smaller size and a little more robust antennae. *D. testaceus* has sometimes head and elytra more or less darkened to entirely black, but prothorax seems to be always fulvous.

Description
Body black with fulvous knees, antennae fulvous or darkened, anterior part of head sometimes fulvous. Head impunctate. Antennae with segments 3-10 subequal, each of them about 2.5-3 times as long as wide. Prothorax strongly cordiform, impunctate, with numerous white erect hairs along anterior and lateral margins. Elytra are practically the same as in *D. testaceus*. Last abdominal sternite of ♂ with deep rounded groove. Aedeagus (Fig. 12) narrow and elongate, with obtuse apex.

Length: 3.3-4.4 mm.

Palpoxena konbirensis Weise

Material: 1♂, Koshi, Simraghat-Lumbughat, 450 m, 14.VI.1985 (M. Brancucci); 1♂, Godavari, 1500 m, 23.V.1985 (M. Brancucci).

The specimens in question have entirely fulvous upperside, but structure of head is quite identical with *P. konbirensis* Weise.

New for Nepal, was known from Bengal.

Paraplotes nepalensis, spec. nov. (det by L. Medvedev)
Fig. 14

Types. Holotype: ♀, Central Nepal, Kathmandu Valley, Godavari, 1500 m, 23.V.1985, leg. M. Brancucci (NHMB). – Paratypes: 2 ex., same locality, 21.-27.V.1989 (M. Brancucci) (NHMB); 1 ex., same locality, 10.-12.VI.1984 (C. Rai) (LM).

Diagnosis. This genus is known from East China, North Vietnam and Taiwan and includes 5 species. Although we have at our disposal only a single ♀, it differs well from all known species. *P. antennalis* Chen, 1942 and *P. clavicornis* Gressitt & Kimoto,1963 have antennal segments 6-7 robust; *P. rugosa* Laboissiere, 1933 has other proportions of antennal segments and fulvous body with black elytra; *P. frontalis* Laboissiere, 1933 has vertex and abdomen black, elytra not fully metallic.

Description
Head black with fulvous labrum and palpi, antennae fulvous with darkened apical half, prothorax fulvous, scutellum black, elytra blackish blue, underside black with fulvous abdomen, legs fulvous with darkened tarsi. Body robust, widened posteriorly, flattened above. Head impunctate, frontal tubercles elongate triangular with acute anterior angles invading in an interantennal space. Vertex with longitudinal impressed line. Antennae (Fig. 14) about ⅔ of body length, thin, with segments cylindrical, except segments 8 and 9, that are more or less triangularly widened at apex; proportions of segments are as 15-6-10-12-11-10-10-8-8-10-15. Prothorax 2.6 times as broad as long, transversely concave, with almost straight and parallel side margins, fore angles protruding, hind angles with quadrate emargination; surface shining and impunctate. Scutellum triangular, impunctate. Elytra 3 times as long as wide in shoulders, broadened behind, with sharp lateral ridge, divided elytra on horizontal and vertical parts; surface without distinct basal convexity, moderately shining, very densely subrugosely punctate.

Length: 6 mm.

Sphenorella, gen. nov.

Genotype: *S. maculata* Kimoto & Takizawa, 1972

Body robust. Head impunctate, clypeus triangular, convex. Interantennal space narrow, carinate. Frontal tubercles distinct, transverse. Maxillar palpi without thickened segments. Antennae a little shorter than the body length, slender, with segments 2 and 3 subequal. Prothorax transverse, unmarginate posteriorly, anterior angles thick, producing, hind angles acute, basal margin emarginate near hind angles; surface uneven, depressed behind anterior angles, with shallow groove on each side behind middle, but without transverse depression. Epipleurae broad at base, gradually narrowed to behind. Wings absent. Anterior coxal cavities closed. Mid and hind tibiae with spurs. Segment 1 of hind tarsi as long as two next segments combined. Claws appendiculate.

Sphenorella maculata Kimoto & Takizawa

Figs 16-18

The species was described as *Sphenoraia*, but differs well in the absence of wings and very distinct and acute hind angles of prothorax. From *Aplosonyx* the new genus differs in the absence of wings and very feeble impressions on prothorax. *Sphenoraia apicalis* Kimoto & Takizawa, 1983 is a new synonym of *S. maculata* with more developed metallic spots on elytra. We have 3 specimens of the species in question, each of them with specific elytral pattern (Figs 16-18).

Material studied: 1 ex., Bagmati, Chautara, 1400-1700 m, 23.-25.VI.1989; 1 ex., Bagmati, Sindhupalchok, Manegero, 2500 m, 13.VI.1989; 1 ex., Kathmandu Valley, Phulchoki, 1500-2700 m, 4.VI.1986.

Strobiderus fulvus Kimoto

Material: 1 ex., Modi Khola, Landrung, 1100-1800 m, 3.-6.VI.1984 (C. Rai).

New for Nepal, was known from India and Bhutan.

Trichobalya viridipennis Kimoto

Material: 1 ex., Arun River-Tumlingtar, 450 m, 16.V.1993 (M. Brancucci).

New for Nepal, was known from North India, Sikkim, Bhutan.

Dercetisoma persimilis (Kimoto) (comb. nov.)

Fig. 20

This species, described as *Arthrotus*, must be better placed in *Dercetisoma* because of straight lateral margins of prothorax and distinct depressions on its surface, according a generic key proposed by Kimoto (1989).

Dercetisoma nepalica, spec. nov.

Figs 19, 22

Types. Holotype: ♂, Central Nepal, Janakpur, Jiri-Shivalaya ,1800-2500 m, 11.-12.VI.1987, leg. C. Rai (NHMB). – Paratypes : 3♂♂, Modi Khola, Pothana, 1900 m, 7.-9VI.1984 (C. Rai); 1♂, Koshi, Mutidhunga-Chitre, 2200-2400 m, 28.V.1985 (M. Brancucci) (NHMB, LM).

Diagnosis. Differs from the other species by extremely short antennal segment 3 and comparatively small size.

Description

Body fulvous, labrum and antennal segments 3-11 dark brown. Legs more or less darkened. Elongate, slightly widened posteriorly. Head shining, impunctate, with longitudinal groove behind frontal tubercles. Antennal segment 2 short, as long as wide; segment 3 extremely short, distinctly transverse, segment 4 about 3.2-3.5 times as long as segments 2 and 3 combined and about 10 times as long as 3; proportions of segments 2-6 are as 5-3-25-18 (Fig. 19). Prothorax 1.6 times as wide as long, with straight side margins, narrowed to base, with anterior angles not protruding laterally; surface deeply grooved on each side and distinctly punctate on grooves and near base. Elytra 1.5 times as long as maximal width, with strong punctures. Segment 1 of anterior tarsi thin, cylindrical, twice as long as wide. Aedeagus is practically the same as in *D. similis* Kimoto, only a little more thin and with more acute apex (Fig. 22).

Length: 3.7 mm.

Males of the 3 species of *Dercetisoma* known from Nepal differ as follows:

Key to the species of *Dercetisoma* of Nepal

1. Antennal segment 3 shorter than 2; segment 4 at least twice as long as segments 2 and 3 combined. Anterior tarsi with segment 1 cylindrical, twice as long as wide. .... 2.

– Antennal segment 3 equal or a little longer than 2; segment 4 about 1.2-1.4 times as long as segments 2 and 3 combined (Fig. 21). Anterior tarsi with segment 1 triangular, 1.2-1.3 times as long as wide .... *concolor* Jacoby

2. Antennal segment 4 about 3.2-3.5 times as long as segments 2 and 3 combined; segment 3 distinctly shorter than 2 (Fig. 19). Body small, 3.7 mm long .... *nepalica*, spec. nov.

– Antennal segment 4 about 2 times as long as segments 2 and 3 combined; segment 3 only a little shorter than 2 (Fig. 20). Body larger, 3.9-6.3 mm long .... *persimilis* Kimoto

Arthrotus cyaneus (Chûjô)

A. hauseri Kimoto, 1967 and *Dercetina viridicyanea* Kimoto, 1977 are new synonyms of *Arthrotus cyaneus* Chûjô, which was described in the genus *Anastena*, a synonym of *Arthrotus* (Medvedev 1992). The species in question has the prothorax without any impressions (especially ♂), or more often distinctly flattened to feebly impressed on each side (in ♀ impression usually more developed). Also punctures vary from feeble and sparse to rather strong, especially on sides. We studied 170 specimens, including type series of *Dercetina viridicyanea* Kimoto.

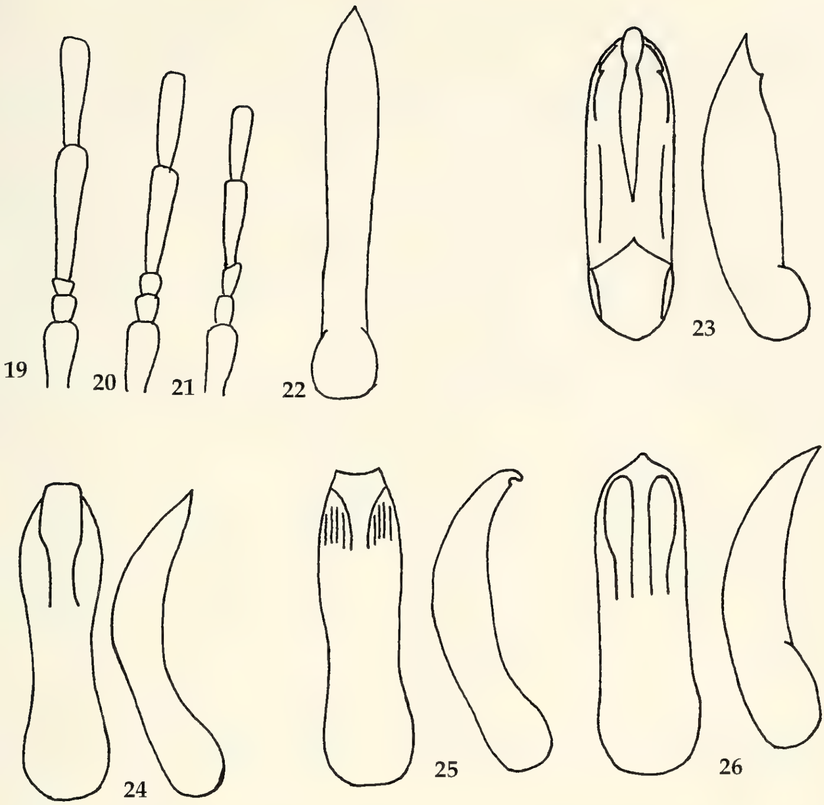
Dercetina picipes (Baly)

Dercetina indica (Duvivier, 1891) and *D. punctipennis* Kimoto, 1977 are new synonyms of this species. We studied a series of 58 specimens (all ♀♀!), including the type series of *D. punctipennis*. The species is very variable in size (7.5-11 mm) and in colour; upperside might be fulvous with more or less distinct metallic sheen, elytra very often bright metallic green or blue, head and prothorax sometimes darkened, underside and legs from fulvous to almost black. But all specimens have strongly punctured elytra with more or less developed lateral ridge.

Dercetina fulvomaculata Takizawa

Material: 1 ex., Bagmati-Kathmandu, pass Bhanjyang-Chaubas, 1900-2200 m, 19.VI.1989 (M. Brancucci).

New for Nepal, was known from West Bengal.



Figs 19-21. *Dercetisoma*, antennal segments 1-5 of ♂. **19.** *D. nepalica*, spec. nov. **20.** *D. persimilis* (Kimoto). **21.** *D. concolor* Jacoby.

Fig. 22. *D. nepalica*, spec. nov, aedeagus ventral.

Figs 23-26. *Euphitrea*, aedeagus ventral and lateral. **23.** *E. foveicollis* Jacoby. **24.** *E. subglobosa* (Hope). **25.** *E. micans* Baly. **26.** *E. laboissierei* (Chen).

Subfamily Alticinae

Livolia assamensis Scherer

This species was recorded for Nepal as *L. minuta* Jacoby, 1897 (Medvedev 1992).

Bhamoina varipes Jacoby

Material: 1 ex., Bagmati, Sindhupalchok, Dubhachaur-Sarmatang, 1600-2500 m, 3.VI.1989 (M. Brancucci).

New for Nepal, was known from India and South-East Asia.

Sphaeroderma darjeelingensis Scherer

Material: 1 ex., Mure Num, 1500-1900 m, 25.V.1980 (W. Wittmer); 1 ex., Taplejung Distr. Yamputhin, 650-1800 m, 26.IV-1.V.1988 (J. Martens & W. Schawaller).

New for Nepal, was known from North India.

Sphaeroderma nigripes Chen

Material: 1 ex., Arun Valley, Rile-Arun river, 300-2000 m, 26.V.1983 (M. Brancucci); 1 ex., Sakhua Sabha Distr., below Karmarang to Hedangna, 950-1350 m, 5.VI.1988 (J. Martens & W. Schawaller); 1 ex., Chitre, Ghar Khola, 2400 m, 26.-31.V.1984 (C. Rai).

New for Nepal, was described from Vietnam.

Argopistes atricollis Chen

Material: 2 ex., Kathmandu, Bagmati River, 1350 m, 19.V.1983 (M. Brancucci); 3 ex., Kathmandu Valley, Burhanilkanth, 1500 m, 21.VI.1985 (M. Brancucci).

New for Nepal, was known from Northern India.

Very often upperside or entire body is fulvous; those specimens are identical in coloration with *A. flavus* Chen, 1934 from South India, but differ well in having regular rows of punctures on elytra.

Pentamesa guttata Weise

Material: 1 ex., Koshi, Mutidhunga-Chitre, 2200-2400 m, 28.V.1985 (M. Brancucci); 1 ex., Phulchoki, 2600 m, 11.-14.VI.1976 (W. Wittmer).

This species was recorded for Nepal by Bryant as *P. trigrapha* Mantik, wich is a synonym of *P. guttata*.

Pentamesa subfasciata Weise

Material: 1 ex., Dhawalagiri, Mustang Distr., Kali-G. Khola, Kalopani, 2500-2800 m, 21.-25.VI.1986 (C. Holzschuh); 1 ex., Parbat Distr., Kusma-Karkineta, 900-1600 m, 2.VII.1986 (C. Holzschuh).

New for Nepal, was known from Northern India.

Euphitrea foveicollis Jacoby
Fig. 23

Material: 1 ex., Bagmati, Sindhupalchok, Gangiwal, 2500 m, 6.-7.VI.1989 (M. Brancucci).

New for Nepal, was known from Assam and Sikkim. However, we are almost sure, that the record of *E. laboissierei* Chen for Nepal (Döberl 1991) refers to this species.

Euphitrea micans Baly 1875 (stat. restit.)
Fig. 25

This species was synonymized with *E. subglobosa* Hope, 1831 (Döberl 1991), but actually it is a very distinct species (see key below). However, this species was erroneously indicated for Nepal (Medvedev 1990), and all localities mentioned for Nepal belong to *E. subglobosa* Hope.

Key to the *Euphitrea micans*-group
(Fulvous species with metallic sheen of upperside)

1. Elytral punctures arranged in very irregular geminate rows among fine dense punctures. Body small, 3.5 mm long. Vietnam (Hoa Binh) .... *coomani* (Chen, 1933)
– Elytral punctures confused. Body larger. .... 2.
2. Excavation near eyes shallow, feebly delimited from vertex. Prothorax with sides elevated, smooth,

divided from rest surface with more or less distinct groove. Aedeagus (Fig. 23) on underside with a central ridge bifurcate anteriorly and delimited on sides with deep grooves. Length 7.7-8 mm. Assam, Sikkim, Nepal .... *foveicollis* Jacoby

– Excavation near eyes deep, delimited from vertex with a sharp ridge. Prothorax without elevated sides and impressions. .... 3.

3. Segment 1 of all tarsi strongly widened. Marginal space of elytra flat and punctured. Aedeagus (Fig. 24) on underside with obtuse or flattened central elevation, narrowed in the middle part. Length 5.2-6.5 mm. Nepal .... *subglobosa* (Hope)

– Segment 1 of all tarsi moderately widened, on hind tarsi distinctly elongate. .... 4.

4. Marginal space of elytra strongly raised, impunctate. Aedeagus (Fig. 25) without central ridge on underside. Length 5.5-6.8 mm. Assam, South India, Burma, South China, Indochina, Malaysia, Indonesia .... *micans* Baly

– Marginal space of elytra not raised, punctured. Aedeagus (Fig. 26) on underside with 2 central ridges, divided with narrow groove. Length 7.5-8 mm. North Vietnam .... *laboissierei* (Chen)

Podagricomela apicipennis (Jacoby)

Material: 1 ex., Koshi, Yaxana-Mulnghat, 450 m, 17.VI.1985 (M. Brancucci).

New for Nepal, was known from Indochina and Malaya.

Hyphasis indica Baly

Material: 1 ex., Num, 1550 m, 5.-6.VI.1983 (M. Brancucci).

New for Nepal, was known from India.

Hyphasis anaimalaiensis Scherer

Material: 1 ex., Dhading Distr., Buri Gandaki, 1100-1300 m, 30.VII.1983 (J. Martens & W. Schawaller).

New for Nepal, was known from South India.

Sebaethe castaneipennis Scherer

Material: 1 ex., Modi Khola, Landrung, 1100-1800 m, 3.-6.VI.1984 (C. Rai); 1 ex., Tatopani, Chitre, 1100-2400 m, 25.V.1984 (C. Rai); 1 ex., Kali Gandaki Khola, Kopchepani, 1500-1600 m, 21.V.1984 (C. Rai).

New for Nepal, was known from India.

Hespera metallica Scherer

Material: 1 ex., Kathmandu Valley, Basantapur, 2300 m, 30.V.-2.VI.1985 (M. Brancucci).

New for Nepal, was known from North India.

Longitarsus ochraceicornis Maulik

Material: 1 ex., 1 km, Ilam Distr., Sanishare, 300 m, mixed Shorea forest, 3.-5.IV.1988 (J. Martens & W. Schawaller).

New for Nepal, was known from Sri Lanka and Singapore.

The specimen is fully identical with a specimen from Singapore, determined by S. Maulik.

Chaetocnema (s. str.) *cognata* Baly

Material: 1 ex., Arun Valley, Chichila, 1950 m, 31.V.1983 (M. Brancucci).

New for Nepal, widely distributed in Northern India.

Chaetocnema alticola Maulik

Material: 1 ex., Koshi, Phulvari-Waku, 1200-1600 m, 9.VI.1995 (M. Brancucci).

New for Nepal, was known from Northern India.

Pseudodera himalayensis Scherer

Material: 1 ex., Koshi, Chitre, 2400 m, 29.V.1985 (M. Brancucci); 1 ex., Koshi, Basantapur, 2300 m, 30.V.-2. VI.1985 (M. Brancucci); 1 ex., Myagdi Distr., Myagdi Khola, Dobang, 2400 m, 25.V.1995 (J. Martens & W. Schawaller).

New for Nepal, was known from West Bengal.

Clitea indica Jacoby

Material: 2 ex., Arun River, Tumlingtar, 450 m, 26.V.1981 (M. Brancucci).

New for Nepal, was known from South India.

Phygasia quadriplagiata Scherer

Material: 1 ex., Dhawalagiri, Kali-G. Khola, Beni-Kusma, 800-1000 m, 30.VI.-1.VII.1986 (C. Holzschuh).

New for Nepal, was known from Northern India.

Subfamily Hispinae

Lasiochila imitans Uhmann

Material: 1 ex., East Nepal, Jubing, 1300 m, 20.VI.1979 (Bhakta B.).

New for Nepal, was described from Assam.

Amblispa laevigata Guerin

Material: 2 ex., Num, 1550 m, 5.-6.VI.1983 (M. Brancucci).

New for Nepal, was known from India and Sri Lanka.

Agonita pallidipennis Maulik

Material: 1 ex., Arun Valley, Hedangna-Num, 800 m, 16.VI.1983 (M. Brancucci).

New for Nepal, was known from Sikkim.

Agonita saundersi Baly

Material: 1 ex., Arun Valley, Hedangna-Num, 800 m, 16.VI.1983 (M. Brancucci).

New for Nepal, was known from Assam.

Downesia gestroi Baly

Material: 1 ex., Arun Valley, Lamobagar Gola, 1400 m, 28.-31.V.1980 (C. Holzschuh).

New for Nepal, was known from Sikkim and Burma.

Notosacantha tenuicula Spaeth

Material: 1 ex., East Nepal, Arun Valley, Chichila, 1950 m, 31.V.1983 (M. Brancucci); 2 ex., Chichila-Mure, 2000 m, 1.VI.1983 (M. Brancucci).

This species was erroneously indicated for Nepal (Takizawa 1988) and later was described as *N. nepala* (Borowiec & Takizawa, 1991). We have at our disposal one specimen, which is a real *N. tenuicula* Spaeth and therefore firstly recorded for Nepal.

Dactylispa confluens Baly

Material: 1 ex., West Nepal, Kali Gandaki Khola, Tatopani, 1100-1200 m, 22.-24.V.1984 (Bhakta B.).

New for Nepal, was known from Burma and Indochina.

Dactylispa platyacantha Gestro

Material: 1 ex., Arun Valley, Num, 1550 m, 5.-6.VI.1983 (M. Brancucci).

New for Nepal, was known from Burma.

Asamangulia tuberculosa Motschulsky (comb. nov.)

Hispa tuberculosa Motschulsky, 1861: 239.

This species was included by Maulik (1919) in the genus *Acmenychus*, with the indication: "type destroyed". We found in Motschulsky's collection the type series, including 4 specimens which are typical *Asamangulia*. *A. cuspidata* Maulik, 1915 is a new synonym of Motschulsky`s species. The species was described from Nepal without exact locality; it is distributed also in Nothern India.

Subfamily Cassidinae

Basiprionota andrewesi (Weise)

Material: 1 ex., Chitwan N. P. Saura, 22.-26.V.1990 (S. Bily).

New for Nepal, was known from Burma.

Cassida desultrix Spaeth

Material: 1 ex., Arun Valley, Chichila, 1950-2000 m, 1.VI.1983 (M. Brancucci).

New for Nepal, was known from Sikkim.

Cassida occursans Spaeth

Material: 1 ex., Koshi, Waku-Sakranti-Thaklung, 1500-2200 m, 10.VI.1985 (M. Brancucci).

New for Nepal, was known from Sikkim and Assam.

Cassida probata Spaeth

Material: 1 ex., Mustang Distr., right banks of Lethe Khola near Lethe, 2400 m, 5.-7.V.1995 (J. Martens & W. Schawaller).

New for Nepal, was known from South China and North Vietnam.

Cassida ruralis Boheman

Material: 1 ex., Himalaya, Everest.

Firstly recorded for Nepal, however, we are not quite sure the determination. This species was described from Java and later registered also for India (Belgaum).

Acknowledgements

We are thankful to Dr. M. Brancucci (Naturhistorisches Museum, Basel) and Dr. W. Schawaller (Staatliches Museum für Naturkunde, Stuttgart) for the opportunity to study this very interesting material.

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Die Gattung *Daramus* Fairmaire in Schwarzafrika

(Insecta, Coleoptera, Cerambycidae, Spondylinae)

Karl Adlbauer

Adlbauer, K. (1998): The genus *Daramus* Fairmaire in Black-Africa (Insecta, Coleoptera, Cerambycidae, Spondylinae). – Spixiana **21/1:** 43-51

The species of the genus *Daramus* Fairmaire, 1892 from tropical Africa are revised. The subgenus *Stridularamus*, subgen. nov. with the species *Daramus* (*Stridularamus*) *ochraceus*, spec. nov. and the taxa *Daramus* (s.str.) *vicinus namibianus*, subspec. nov. as well as *Daramus* (s.str.) *hovorkai*, spec. nov. are described.

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Einleitung

Die Gattung *Daramus* wurde von Fairmaire (1892) mit der Typusart *D. serricornis* von Obock (= Djibouti) beschrieben; weitere Daten zur Verbreitung steuerte Lepesme (1948) bei. Ferreira (1955) meldete die bekannte Art auch von Mocambique und Zimbabwe und beschrieb zusätzlich eine zweite Art, *D. vicinus* aus Transvaal. Sowohl die Beschreibung als auch die übersetzte Bearbeitung in Ferreira & Veiga Ferreira (1957) machen es trotz Abbildung faktisch unmöglich, diese beiden Arten zu unterscheiden. Einerseits wurden ganz offensichtlich in der von Ferreira (1955) erstellten Bestimmungstabelle die Größenangaben vertauscht und später (Ferreira 1957) unkritisch übernommen, andererseits lag Ferreira als Vergleichsmaterial bei der Beschreibung nicht *D. serricornis*, sondern eine andere, noch unbeschriebene Art vor.

Sama (1994) revidierte schließlich die Gattungen *Daramus* und *Tetropiopsis* Nordafrikas, dabei überführte Sama die Arten *T. major*, *T. obscurus* und *T. macrops* in die Gattung *Daramus* und beschrieb *D. mehennii* als vierte im paläarktischen Gebiet Afrikas lebende *Daramus*-Art. Während *D. serricornis* behandelt und in den Bestimmungsschlüssel eingebaut wurde, erwähnte Sama jedoch *D. vicinus* überhaupt nicht.

Unbefriedigende Versuche, *Daramus*-Arten aus dem südlichen Afrika zu bestimmen sowie das Vorliegen einer aberranten, (offenbar) noch unbekannten Art aus Zimbabwe und Namibia, haben mich veranlaßt, das nicht häufige *Daramus*-Material genauer zu untersuchen und zu revidieren. Als Ergebnis hat sich gezeigt, daß die Gattung zwei unterschiedliche Erscheinungsbilder aufweist, die als Untergattungen interpretiert werden, und daß drei neue Taxa der Artgruppe in dieser Revision neu beschrieben werden können.

Systematische Stellung

Fairmaire (1892) verglich die Gattung *Daramus* bei der Beschreibung mit den Gattungen *Cyamophthalmus* (= *Alocerus*) und *Tetropium*, woraus sich eine Zugehörigkeit zur Unterfamilie Spondylinae ableiten läßt. Lepesme (1948) bekräftigte die systematische Zugehörigkeit zur Unterfamilie Aseminae (= Spondylinae). Auch Ferreira (1955) behandelte bei ihrer Zusammenstellung der Asemini Südafrikas die Gattung *Daramus*, was von Ferreira & Veiga Ferreira (1957 und 1959) ebenso gesehen wurde.

Sama (1994) hingegen stellte besonders aufgrund von Larvalmerkmalen die Gattung *Tetropiopsis* – und analog dazu auch *Daramus* – zur Tribus Hesperophanini in die Unterfamilie Cerambycinae. *Daramus*-Larven sind bis jetzt nicht bekannt, doch die bei *Daramus*-Imagines festzustellende geteilte Stridulationsfläche bzw. das offensichtliche Fehlen einer solchen, wie auch das Flügelgeäder weisen die Vertreter der Gattung *Daramus* viel mehr als zur Unterfamilie Spondylinae zugehörig aus; sie werden hier zur Tribus Saphanini gestellt.

Abkürzungen

(A)	Coll. Dr. Karl Adlbauer, Graz
(H)	Coll. Dr. Walter Hovorka, Wien
(MHUB)	Museum der Humboldt Universität, Berlin
(MRAC)	Musée Royal de l'Afrique Centrale, Tervuren
(NMN)	The National Museum of Namibia, Windhoek
(TMP)	Transvaal Museum, Pretoria

Daramus Fairmaire, 1892

Fairmaire, 1892: 121.

Diagnose. Schlank, einfärbig gelbbraun bis schwarz, schütter halbanliegend und abstehend behaart bzw. beborstet. Größe 6.5-17 mm. Augen sehr groß, kugelig vorstehend und grob facettiert, nur beim ♀ der Untergattung *Stridularamus*, subgen. nov. von normaler Größe. Antennen bei den ♂♂ ab dem 3. Glied deutlich gesägt und stark abgeflacht, so lang oder kürzer als der Körper; bei den ♀♀ höchstens die Mitte der Elytren erreichend. Palpenendglieder bei der Untergattung *Daramus* s.str. stark dreieckig erweitert, bei *Stridularamus*, subgen. nov. schwach verbreitert. Pronotum etwa so lang wie breit oder leicht quer, trapezförmig, an der Basis schmäler als am Apex. Seiten gerundet oder etwas vorstehend gerundet, aber ohne Dorn oder Seitenhöcker. Dorsal entweder einfach (*Stridularamus* subgen. n.) oder dicht wabenartig punktiert (*Daramus* s.str.). Elytren glänzend bis matt, dicht punktiert. Beine bei *Daramus* s. str. ebenfalls deutlich punktiert. Vorderhüfthöhlen außen stark eckig erweitert, ebenso wie die Mittelhüfthöhlen offen. Vordercoxen fast aneinanderstehend, nur durch einen lamellenförmigen Prosternalfortsatz voneinander getrennt.

Bestimmungstabelle der Untergattungen von *Daramus* Fairmaire

Antennen kürzer als der Körper, Pronotum dicht wabenartig punktiert. Mesonotum ohne erkennbare Stridulationsfläche .... *Daramus* (s.str.)

Antennen beim ♂ so lang wie der Körper, Pronotum einfach punktiert. Mesonotum mit geteilter Stridulationsfläche .... *Stridularamus*, subgen. nov.

Untergattung *Daramus* s. str.

Dunkel kastanienbraun bis schwarz (die paläarktischen Arten sind heller), Palpenendglieder stark dreieckig erweitert, Antennen in beiden Geschlechtern kürzer als der Körper, Pronotum dicht wabenartig punktiert, Mesonotum ohne erkennbare Stridulationsfläche.

Tabelle der *Daramus* s. str.-♂♂

1. Scapus etwa so lang wie das 3. Antennenglied .... 2.
– Scapus viel kürzer als das 3. Antennenglied .... *D. hovorkai*, spec. nov.

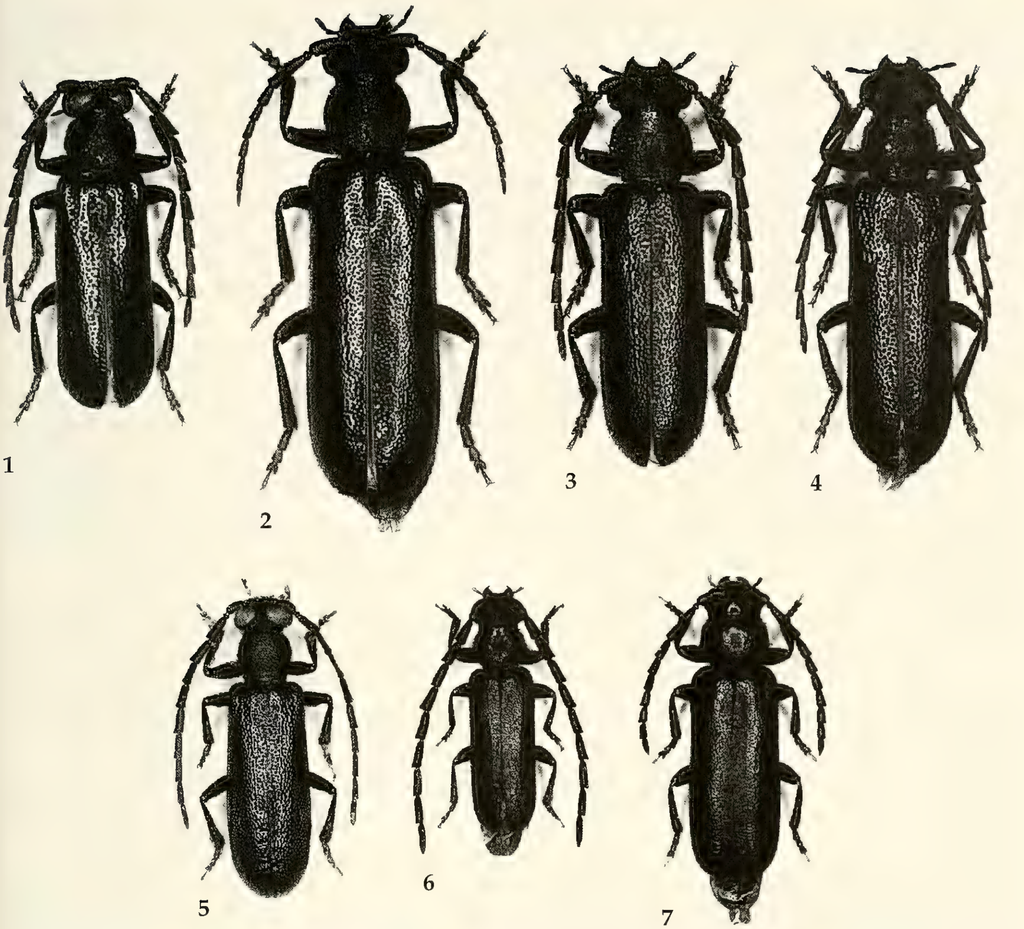

Abb. 1-7. Habitus. 1. *Daramus serricornis* Fairm., ♂, Somalia, 11.5 mm. 2. *Daramus* sp., ♀, Äthiopien, 17 mm. 3. *D. v. vicinus* Ferr., ♂, Transvaal, 13.5 mm. 4. *D. vicinus namibianus*, subspec. nov., ♂ Holotypus, Namibia, 14 mm. 5. *D. hovorkai*, spec. nov., ♂ Paratypus, Angola, 10.5 mm. 6. *D. ochraceus*, spec. nov., ♂ Paratypus, Zimbabwe, 9 mm. 7. *D. ochraceus*, spec. nov., ♀ Paratypus, Namibia, 11 mm (Fotos: K. Adlbauer).

2. Elytren seidenglänzend bis matt, Behaarung dunkelbraun bis schwarz .... 3.
– Elytren stark glänzend, Behaarung goldgelb .... *D. serricornis* Fairmaire

3. Pronotum breiter als lang .... *D. v. vicinus* Ferreira
– Pronotum so lang wie breit .... *D. vicinus namibianus*, subspec. nov.

Daramus (s. str.) *serricornis* Fairmaire, 1892
Abb. 1

Fairmaire, 1892 :121.

Locus typicus: Obock (=Djibouti).

Untersuchtes Material: 1♂, Somalia, Mogadiscio, 7 km, 22.4.-5.5.1984, R. Mourglia leg., *Daramus serricornis* Fairm., det. R. Mourglia (A); 1♂, 1♀, Tschad, N'Gouri, distr. de Kanem, VIII-58, P. Renaud, Det.

8014 M (Coll. Mus. Congo); 1♂, Tchad, confl. du Chari et du Cameroun, VII/VIII-58, P. Renaud, Det. 8014 M (MRAC).

Beschreibung

Die am stärksten glänzende Art, einheitlich dunkel rotbraun, Tibien etwas angedunkelt, Antennen bei den ♂♂ ab dem 3. Glied matt dunkelbraun, bis zum letzten Elytrenviertel reichend; beim einzigen untersuchten ♀ ebenso gefärbt, aber glänzend und punktiert.

Pronotum von der Mitte zur Basis trapezförmig verengt, der Basalrand schmäler als der Vorderrand; beim ♀ im Verhältnis zum ♂ kürzer, aber genau so breit – breiter als von Sama (1994: 179) angegeben. Sama beschreibt in der Tabelle das Pronotum des ♀ und verweist auf Fig. 2, wo allerdings das Pronotum des ♂ dargestellt ist. Oberfläche dicht wabenförmig punktiert, in der Mitte nahe der Basis eine kleine, glatte und stark glänzende Fläche.

Elytren dicht, aber einfach punktiert, stark glänzend, Apex abgerundet.

Gesamte Oberfläche lang abstehend goldgelb beborstet, beim ♀ eher gelbbraun, zusätzlich dazu sind die Elytren halbanliegend mit nach hinten gerichteten Haaren ebenfalls goldgelb bzw. gelbbraun behaart. Beine – besonders die Tibien – lang abstehend und halbanliegend beborstet bzw. behaart. Antennen bei den ♂♂ am deutlich punktierten und glänzenden Scapus und am Pedicellus mit einzelnen abstehenden Borsten, die restlichen Glieder besonders am inneren Spitzenrand mit einzelnen lang schräg abstehenden Borsten, beim ♀ wesentlich stärker beborstet.

Das von außen nicht sichtbare Analtergit deutlich quer, gewölbt, jedoch vor dem ausgerandeten Apex eingedrückt. Parameren mäßig breit, in eher kurze Spitzen ausgezogen.
Größe: 10-14 mm.

Verbreitung. N-Senegal (Breuning & Villiers 1972), Niger (Air, Villiers 1950, Lepesme & Breuning 1955, Quentin & Villiers 1980), Tschad (Tibesti, Breuning & Villiers 1960), Sudan (Darfur), Saudi Arabien, N-Jemen (Lepesme 1948, Villiers 1977), Djibouti, Somalia, Kenya (Fairmaire 1892, Lepesme 1948, Quentin & Villiers 1979). Von der Sahara bzw. der Sahelzone konnten nur Tiere vom S-Tschad überprüft werden.

1♀ fraglicher Artzugehörigkeit (Abb. 2): Äthiopia, Arba Minch, Gemu Gofa Prov., April 1994, K. Werner leg (A).

Beschreibung. Dunkler als das ♀ von *D. serricornis,* leicht seidenglänzend. Antennen bis zum Ende des 1. Elytrendrittels reichend, schwarzbraun, punktiert, Antennenglieder leicht glänzend, aber weniger als beim ♀ (des ♀ fraglicher Artzugehörigkeit) *D. serricornis*, das 3. Antennenglied erscheint schlanker. Das Pronotum schmäler als die von Elytren an den Schultern. Körper dunkelbraun, überall relativ dicht abstehend braun beborstet (am Vorderkörper gelbbraun), auch die Antennen deutlich abstehend beborstet und zusätzlich – wie die Elytren – halbanliegend dunkel behaart. Insgesamt dichter abstehend beborstet als das ♀ von *D. serricornis*, das allerdings stark abgerieben ist.

Größe: 17 mm.

Daramus (s. str.) *vicinus vicinus* Ferreira, 1955
Abb. 3

Ferreira, 1955: 368.

Locus typicus: Wylie's Poort, Transvaal.

Untersuchtes Material: ♂, Holotypus, Wylie's Poort, 7.XI.1920, C. J. Swierstra, Col. M. Holotype ♂, *Daramus vicinus* M. C. Ferreira 1953 (TMP); ♀, Allotypus, Wylie's Poort, 6.XI.1920, C. J. Swierstra, Alotype ♀, *Daramus vicinus* M. C. Ferreira, 1953 (TMP); 1♂, Transvaal, Limburg, Tvl., Potgietersrus Distr., 19.-21.XI.1968, L. Vari, *Daramus serricornis* Fairm., Quentin & Villiers det 1977 (TMP); 1♂, Transvaal, Fiesta Motel 20 km S Potgietersrus, 24°17'S, 28°51'E, 1100 m, 19.11.1992, H. Hölzel, P. Ohm & M. W. Mansell leg. (A); 1♂, Namibia, Okaukuejo (=Etosha Nat. Park), Südwestafrika, 9.12.1977, SO 1915 BB, R. Oberprieler; H 43092, R. Oberprieler collection (NMN); 1♂, 4.12.37, Licht, No. 9, H 11288 (NMN).

Beschreibung
Einheitlich dunkel rotbraun bis pechbraun, Sternite etwas dunkler. Antennen ab dem 3. Glied schwarz, beim ♂ matt und unpunktiert, bis zum letzten Elytrendrittel reichend, beim ♀ auch schwarz, aber mit deutlicher Punktierung und glänzend, etwa bis zum Ende des 1. Elytrendrittels reichend.

Vordertibien fast zur Gänze, Mittel- und Hintertibien an der Basis schwarz, an der Spitze dunkel rotbraun.

Augen bei den ♂♂ sehr groß, kugelförmig, beim ♀ merklich kleiner.

Pronotum breiter als lang, von der Mitte zur Basis trapezförmig verengt, der Basalrand schmäler als der Spitzenrand, beim ♀ breiter als beim ♂, insgesamt aber variabel ausgebildet. An der Basis in der Mitte (vor dem Scutellum) eine kleine, unpunktierte Fläche, sonst dicht wabenförmig punktiert.

Elytren ebenfalls dicht aber einfach punktiert, matt bzw. schwach seidenglänzend, Apex abgerundet.

Kopf, Pronotum und Basalhälfte der Elytren oder die ganzen Elytren lang abstehend rotbraun beborstet, zusätzlich halbanliegend nach hinten geneigt ebenfalls rotbraun behaart. Beine – insbesondere die Tibien – lang abstehend und halbanliegend beborstet bzw. behaart. Die Antennen weisen bei den ♂♂ am dicht punktierten und glänzenden Scapus und Pedicellus lang abstehende Borsten auf, die restlichen Glieder nur an der Spitze, besondes der Innenseite, mit einzelnen, länger abstehenden Borsten. Beim ♀ tragen die Antennenglieder lang abstehende Borsten, dadurch die Antennenglieder wesentlich auffälliger beborstet als bei den ♂♂.

Analtergit gleichmäßig gewölbt mit lang abstehenden Borsten, Parameren breit ringförmig, beim ♂ von N-Namibia aber schmäler!

Größe: 13,5-17 mm.

Verbreitung. Transvaal, N-Namibia (Etosha Nat. Park).

Daramus (s. str.) *vicinus namibianus*, subspec. nov.

Abb. 4

Typen. Holotypus: ♂, Namibia, Karibib, Jänner 1992, Lichtanflug, A. Rautenstrauch leg. (A). – Paratypus: 1♂, mit den selben Daten (A).

Beschreibung
Pechbraun, fast schwarz, schlanker als die typische Subspezies und die übrigen Arten; heller sind nur die Tarsen, die Palpen, die teilweise angedunkelt sind und die Mandibeln mit Ausnahme der Spitzen. Abdomen braun.

Kopf grob gerunzelt puktiert und matt. Scapus dicht punktiert aber glänzend, Antennenglieder ab dem 3. abgeflacht, schwarz matt, bis zum letzten Elytrenviertel reichend.

Pronotum so lang wie breit, dicht wabenartig punktiert, matt; eine unpunktierte Stelle an der Basis ist nur beim Paratypus sehr undeutlich erkennbar.

Elytren dicht, einfach punktiert, schwach seidenglänzend, Apex gemeinsam abgerundet.

Kopf und Pronotum nicht sehr dicht dunkel abstehend beborstet, beim Holotypus fast schwarz, beim Paratypus dunkelbraun. Auf den Elytren – besonders an der Basis – ebenfalls abstehende Borsten, die aber im Vergleich zu den anderen Taxa schwächer ausgebildet sind. Zusätzlich dazu die Elytren halbanliegend behaart. Beine deutlich abstehend beborstet. Antennen ab dem 3. Glied unbehaart, nur an der Spitze der Antennenglieder, besonders am Innenrand, ausnahmsweise auch am Distalrand, einzelne abstehende Borsten.

Analtergit gleichmäßig gewölbt, vor dem Apex schwach verflacht, aber nicht eingedrückt. Randborsten nicht sonderlich zahlreich. Parameren mäßig breit, ähnlich geformt wie bei *D. serricornis*, jedoch Spitzen länger ausgezogen.

Diese Subspezies sieht auf dem ersten Blick völlig anders aus als *D. vicinus* s. str., doch scheint es im Norden Namibias eine Population von *D. vicinus* zu geben, die sich in der Habitusform wie auch in der Form der Parameren der Subspezies *namibianus* annähert bzw. Übergangsformen bildet. Eine entgültige Beurteilung ist nach dem geringen mir vorliegenden Material zur Zeit aber nicht möglich.

Größe: 12,5-14 mm.

Verbreitung. Namibia (Karibib).

Daramus (s. str.) *hovorkai*, spec. nov.
Abb. 5

Typen. Holotypus: ♂, Mocambique, Magude, 10.1918, C. J. Swierstra, *Daramus serricornis* Fairm., M. Corinta Ferreira (TMP). – Paratypen: 1♂, Zimbabwe, Matetsi, S. Rhodesia, 10.XI.1934, R. H. R. Stevenson, *Daramus serricornis* Fairm., M. C. Ferreira (TMP); 1♂, Zimbabwe, Nembudziya (Harare – Lake Kariba), Ende Nov. 1995, S. Hovorka leg (H); 1♂, Zimbabwe, 20 km E Ngundu (S Masvingo), 14.12.1995, W. Hovorka leg. (A.); 1♂, Angola, Capangombe, 5 km E, 15°05'S, 13°10'E, 17.-20. Nov. 1974, H 23049 (NMN); 1♂, Mus. Roy. Afr. Centr., Zululand, Maputa (Rev. W. Hunt), ex coll. Dr Breuning, *Daramus serricornis* Frm., E. Fuchs det., 1970 (MRAC).

Beschreibung
Einheitlich dunkelbraun, Vorderkörper bei frischen Exemplaren etwas dunkler, heller sind nur die Palpen. Im Körperbau zarter als die bisherigen Taxa.

Antennen verhältnismäßig lang, das letzte Elytrenviertel erreichend oder sogar überragend, nur schwach gesägt. Scapus sehr klein, kürzer als das 3. Glied, glänzend und deutlich punktiert. Antennen ab dem 3. Glied dunkelbraun, matt und abgeflacht.

Pronotum schmal, dicht wabenartig punktiert, eine glänzende, unpunktierte Fläche vor der Basis ist nur in einem einzigen Fall undeutlich erkennbar.
Elytren dicht punktiert, beiderseits im dritten Viertel lateral (in der Mitte zwischen Sutur und Seitenrand) etwas eingedrückt, Apex abgerundet.

Oberfläche sehr deutlich abstehend beborstet, Elytren zusätzlich fein halbanliegend behaart. Antennen ebenfalls sehr deutlich abstehend beborstet, auch die anliegende Bahaarung ist deutlicher als bei den anderen Taxa. Die abstehenden Borsten auf der Innenseite der basalen Glieder (ab dem 3. Glied) gleichmäßig verteilt, nicht nur am Spitzenrand entwickelt. Beine ebenfalls lang abstehend beborstet und halbanliegend behaart. Behaarung und Beborstung braun.

Analtergit gewölbt, am Apex ausgerandet und davor leicht verflacht, stark und lang abstehend beborstet. Parameren sehr schlank.

Größe: 8-11 mm.

Verbreitung. Angola, Zimbabwe, Mocambique, Natal.

Etymologie. Herrn Dr. Walter Hovorka, von dem ich die ersten Exemplare dieser neuen Art gesehen habe, herzlichst gewidmet.

UG. *Stridularamus*, subgen. nov.

Körper gelbbraun, Palpenendglieder nur schwach erweitert, Antennen beim ♂ körperlang, beim ♀ die Mitte der Elytren erreichend. Pronotum einfach punktiert, Mesonotum mit deutlicher, geteilter Stridulationsfläche.

Daramus (Stridularamus) ochraceus, spec. nov.
Abb. 6, 7

Typen. Holotypus: ♂, Namibia, Okaukuejo (=Etosha Nat. Park), Südwestafrika, 21.XII.1977, SO 1915 BB, R. Oberprieler, H 43129. R. Oberprieler Collection (NMN). – Paratypen: 1♂, Namibia, Etosha NP, Halali, 19°01'S, 16°29'E, 16.-17.XII.1993, lux/pitfall trap, leg. M. Uhlig (MHUB)[1]; 1♀, Namibia, Toshari Inn, 70 km NNW Outjo (= 40 km S Okaukuejo), Namibia, 18.1.1996, Lichtanflug, K. & F. Adlbauer leg. (A); 1♂, Zimbabwe, Nembudziya (Harare – Lake Kariba), Ende Nov. 1995, S. Hovorka leg. (H).

Beschreibung
Hell gelbbraun-orangerot gefärbt, dunkler nur die Mandibelspitzen, die Antennen vom 3. Glied an und beim ♀ die Spitzen der Tibien. Körper dicht fein punktiert und matt seidenglänzend. Das ♀ deutlich korpulenter als die ♂♂.

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[1] zugleich: 41. Beitrag der Ergebnisse der entomologischen Afrika-Expeditionen des Museums für Naturkunde Berlin

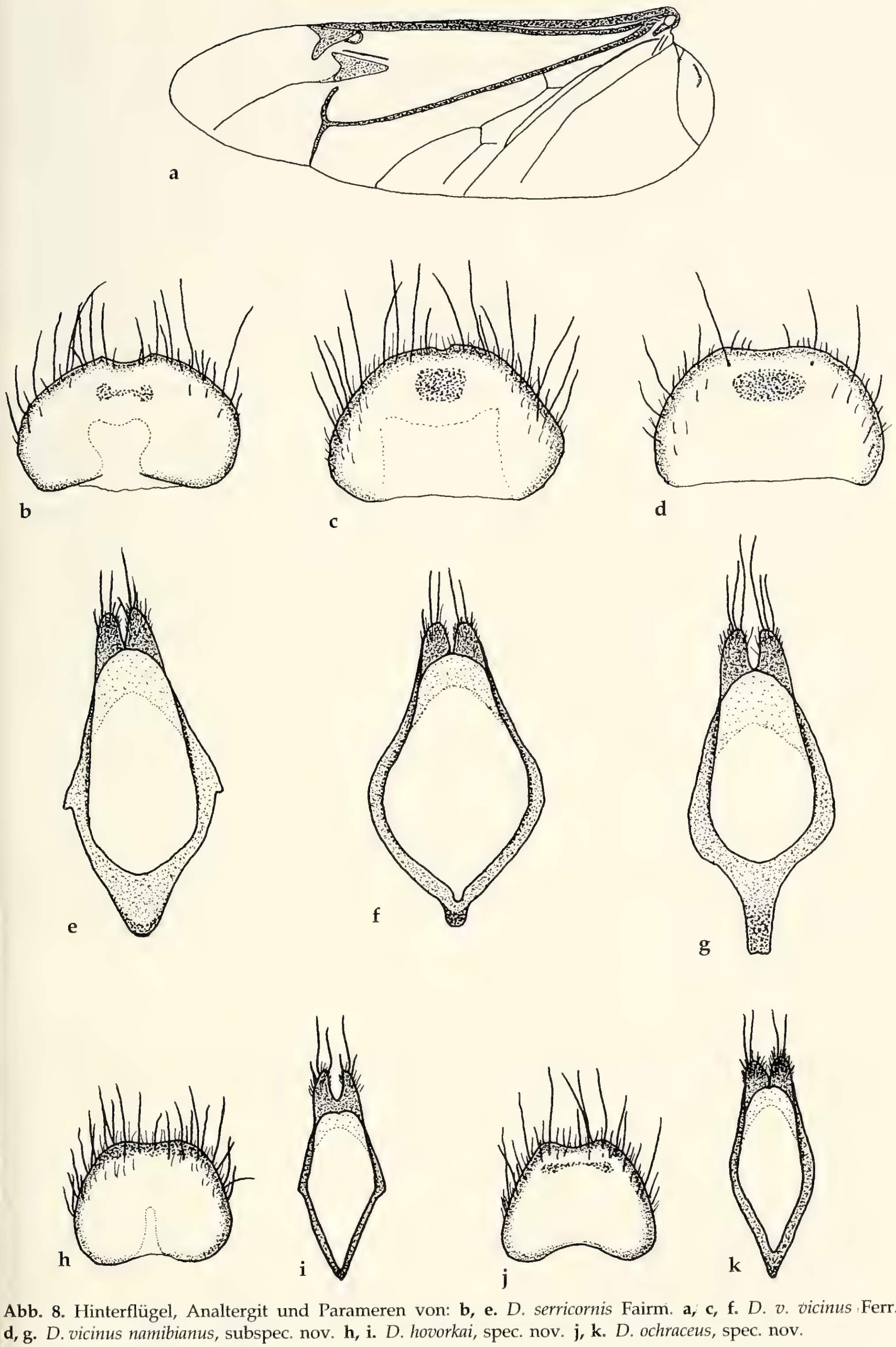

Abb. 8. Hinterflügel, Analtergit und Parameren von: **b, e.** *D. serricornis* Fairm. **a, c, f.** *D. v. vicinus* Ferr. **d, g.** *D. vicinus namibianus*, subspec. nov. **h, i.** *D. hovorkai*, spec. nov. **j, k.** *D. ochraceus*, spec. nov.

Augen bei den ♂♂ groß und kugelig, beim kleineren Holotypus allerdings schwächer entwickelt als bei den ♂ Paratypen; beim ♀ wesentlich kleiner.

Scapus sehr kurz, birnenförmig, Antennen bei den ♂♂ ab dem 3. Glied dunkelbraun, stark abgeflacht und matt. Beim ♀ das 3. Glied dunkelbraun, punktiert und glänzend, der Rest der Antennen schwarz, mit Ausnahme der verjüngten Spitze des 11. Gliedes, die hellbraun ist. Antennen beim ♀ punktiert und seidenglänzend.

Pronotum quer, zur Basis nur leicht eingezogen, dicht einfach und gleichmäßig punktiert, dorsal vor der Basis in der Mitte sehr schwach gehöckert.

Oberfläche mäßig dicht halbanliegend goldgelb behaart und nur schütter mit goldgelben, längeren abstehenden Borsten am Kopf, Pronotum und der Basis der Elytren besetzt. Antennen bei den ♂♂ fast unbehaart, beim ♀ hingegen deutlich halbanliegend behaart und auf der Innenseite abstehend beborstet. Beine schütter abstehend behaart.

Analtergit trapezförmig, nur schwach gewölbt, an der Spitze ausgerandet und mit langen Borsten versehen, Parameren schlank.

Größe: ♂♂ 7-9 mm, ♀ 11 mm.

Verbreitung. N-Namibia, Zimbabwe.

Diskussion

Die *Daramus*-Arten scheinen ohne Ausnahme typische Bewohner von Trocken- bzw. Halbtrockengebieten zu sein. Von den Fundgebieten, die mir selbst bekannt sind, befinden sich Halali, Okaukuejo und Toshari Inn in einer Mopanesavanne, Karibib liegt im Savannen-Halbwüsten-Übergangsbereich. Auch alle anderen hier aufgelisteten oder in der Literatur genannten Gebiete – die paläarktischen Arten eingeschlossen – beziehen sich auf Trockensavannen oder Halbwüstengebiete.

Zur Biologie berichtet Sama (1994), daß "fast nichts" bekannt sei, immerhin wird mitgeteilt, daß D. *mehennii* auf *Acacia raddiana* gefangen wurde. *D. macrops* stammt aus einem Gebiet, in dem als einzige verholzte und damit als Entwicklungssubstrat in Frage kommende Pflanzen *Acacia raddiana* wachsen würden. Auch *D. serricornis* schließlich wurde von R. Mourglia auf *Acacia* sp. gefunden. Mehr ist über die Brutsubstrate nicht bekannt.

Die Lebensweise ist als eine nachtaktive mit positiver Phototaxie anzusehen.

Zusammenfassung

Die Arten der Gattung *Daramus* Fairmaire, 1892 Schwarzafrikas werden revidiert. Die Untergattung *Stridularamus*, subgen. nov. mit der Art *Daramus* (*Stridularamus*) *ochraceus*, spec. nov. und die Taxa *Daramus* (s. str.) *vicinus namibianus*, subspec. nov. sowie *Daramus* (s.str.) *hovorkai*, spec. nov. werden beschrieben.

Dank

Mein Dank gilt meinen Freunden Dr. Walter Hovorka, Wien und Riccardo Mourglia, Torino, weiters den Herrn Albert Rautenstrauch, Augsburg, Karl Werner, Peiting, wie auch den Damen und Herren Kustoden Dr. Eliane De Coninck, Tervuren, Dr. Chuck Bellamy, Pretoria, Eugene Marais, Windhoek und Dr. Manfred Uhlig, Berlin für die Bereitstellung von *Daramus*-Material.

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Buchbesprechungen

1. Boyd, L. & K. Houbt: Przewalski's Horse – The History and Biology of an endangered Species. – State University of New York Press, 1994. 313 S.

Diese sehr erfreuliche Neuerscheinung schließt als umfassendes Standardwerk über die Geschichte und Biologie des Przewalski-Pferdes eine seit langem bestehende Lücke. Sie behandelt unter Verwertung neuester Erkenntnisse und Erfahrungen kompetenter Wissenschaftler und Fachleute übersichtlich und auch für den interessierten Laien in verständlicher Weise alle wesentlichen Aspekte der Herkunft, Haltung und Zucht.

Sehr beeindruckend sind die Kapitel über die Entdeckung und die weltweiten Bemühungen um die Erhaltung und Vermehrung der wenigen in Gefangenschaft gelangten Tiere, die in der Freiheit inzwischen wohl gänzlich verschwunden sind. Die dabei auftretenden Probleme der Inzucht in Verbindung mit der für das Überleben einer vom Aussterben bedrohten Tierat notwenigen Gewährleistung einer möglichst großen Genvielfalt werden besonders deutlich herausgestellt. Sie sind von grundlegender Bedeutung und können auch als Beispiel für analoge Fälle dienen.

Dieses Buch zeigt, daß es allen Kritikern zum Trotz sinnvoll und möglich ist, durch sog. Erhaltungszuchten in Zoos aus Restbeständen einer Tierart überlebenfähige Populationen aufzubauen und sie in ihren früheren Lebensräumen wiederanzusiedeln. In unmißverständlicher Weise wird dem Laser aber auch klargemacht, daß der Erfolg solcher Maßnahmen von der Erfüllung zahlreicher faktischer und organisatorischer Voraussetzungen abhängt. Es bleibt, mit den Autoren zu hoffen und zu wünschen, daß die Wiedereinbürgerung des Przewalski-Pferdes als Urahn des Hauspferdes, das in einzigartiger Weise die Entwicklung des Menschen mitgetragen und geprägt hat, erfolgreich sein wird. Denn auf die Dauer wird es nur in seiner Heimat überleben können. Möge dieses Buch dazu beitragen.

W. Huber

2. Perera, G. & J. G. Walls: Apple Snails in the Aquarium. – Publications, Neptune/U.S.A., 1996. 121 pp. ISBN 0-7938-2085-5 hbk.

This little volume provides a survey on one of the most popular snail families in freshwater aquaria – the Ampullariidae, commonly known as Apple Snails. Species of this remarkable family are found in subtropical and tropical wet and freshwater habitats in the Old and New World. Nearly uniquely among gastropods they are able to respirate facultatively air by a true lung or under water by a gill. They are easily to keep alive in aquaria and many species even breed in captivity.

The introductory chapter of the volume provides general information on ampullariids, concerning ecological, economic, and medical aspects. A brief description of morphology and anatomy follows, unfortunately the latter without any illustration. The second chapter concerns biology and ecology, followed by an extensive chapter on "apple snails in the aquarium". Unfortunately some (entirely unnecessary) "product information" has found its way between these pages. Chapters four and five describe and figure the most important species in America and Africa. However, according to experts (Robert H. Cowie in litt.) there are some misidentifications: On page 15 (yellow specimens), pages 39, 43, and 44 (again the yellow ones) "*Pomacea bridgesi*" (original spelling was *bridgesii*!) probably is *Pomacea canaliculata*. Finally a chapter on "other aquarium snails" provides a nice survey on this subject showing living Viviparids ("mystery snails"), Lymnaeidae ("pond snails"), Planorbidae ("ramshorns"), Physidae ("tadpole snails"), Thiaridae ("melanias"), and Neritidae ("nerites"). Appendices include "a couple of apple snail recipes"(?!), a fine and helpful glossary, and a bibliography.

This is a book for the non-specialist and aquarist and accordingly the strength of this volume lies in excellent color photos of various species and aspects (e.g. spawn masses) of ampullariids and other aquaria snails. On the other hand I miss ideas and proposals how amateur's enthusiasm and energy may provide significant results for the scientific community, e.g. providing data on reproductive biology, ontogeny, or parasites. Whereas the pure aquarist might benefit from the lecture of this volume, the general biologist and malacologist probably will be disappointed.

G. Haszprunar

SPIXIANA	21	1	53–58	München, 01. März 1998	ISSN 0341-8391

Taxonomic remarks on Australian Dryinidae with description of new species*

(Insecta, Hymenoptera, Chrysidoidea)

Massimo Olmi

Olmi, M. (1998): Taxonomic remarks on Australian Dryinidae with description of new species (Insecta, Hymenoptera, Chrysidoidea). – Spixiana **21/1:** 53-58

In this paper the following new species of Dryinidae are described: *Anteon maurum*, *Anteon zborowskii*, and *Dryinus zborowskii*, from Australia; *Anteon vitiense*, from the Fiji Islands. Besides the following new synonymy is established: *Anteon fijianum* Olmi, 1984 (p. 569) = *Anteon yasumatsui* Olmi, 1984 (p. 424). *A. yasumatsui* has the priority.

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Introduction

The Dryinidae (Hymenoptera, Chrysidoidea) are parasitoids of Homoptera Auchenorrhyncha (Olmi 1984, 1994). In the last years the systematics of the Dryinidae was revised mainly by Olmi (1984, 1989, 1993, 1994, 1995). According to the old papers of Perkins (1905, 1906a, 1906b, 1907, 1912) and the more recent contributions of Olmi (1984, 1986, 1987a, 1987b, 1987c, 1992a, 1992b, 1993), in the Australian zoogeographic region 197 species of Dryinidae belonging to 18 genera and 7 subfamilies are known. Recently, further new species were recognized in some collections. The aim of this paper is to describe these new taxa.

Material and methods

The material examined in this paper is deposited in the following collections:

B Bishop Museum, Honolulu, Hawaii, U.S.A
CB Australian National Insect Collection (ANIC), CSIRO, Canberra, Australia
LA Natural History Museum of Los Angeles County, Los Angeles, California, U.S.A
OL M. Olmi's collections, c/o Dipartimento di Protezione delle Piante, Universit della Tuscia, Viterbo, Italia

The descriptions follow the terminology used by Olmi (1984) and revised after Gauld & Bolton (1988) and Olmi (1994). The measurements reported are relative, except for the total length (head to abdominal tip, without the antennae), which is expressed in millimeters.

* Studies of the C.N.R. Working Group for the Study of Interactions among Pathogens, Parasites and Agricultural and Forest Plants.

In the descriptions POL is the "distance between the inner edges of the two lateral ocelli"; OL is the "distance between the inner edges of a lateral ocellus and the median ocellus"; OOL is the "distance from the outer edge of a lateral ocellus to the compound eye"; OPL is the "distance from the posterior edge of a lateral ocellus to the occipital carina"; TL is the "length of the temples".

The study techniques are those proposed by Olmi (1984).

The types of all the species of *Anteon* Jurine, 1807 and *Dryinus* Latreille, 1804 known in the Australian region were examined.

Anteon maurum, spec. nov.

Fig. 1A

Types. Holotype: ♀, Australia, South Australia, Brookfield Cons. Park, 34°21'S 139°29'E, 24.-26.XI.1992, I. Naumann & J. Cardale coll. (CB).

Description

♀ holotype. Fully winged; length 2.12 mm; head black, with mandibles testaceous; antennae testaceous; thorax and propodeum black; gaster brown; legs testaceous, with hind coxae and hind trochanters brown; antennae distally thickened; antennal segments in the following proportions: 8.5-5-5.5-4-3-3-3.5-3.5-4-5; antennal segment 9 hardly longer than broad (4:3); head shiny, smooth, punctate, without sculpture among the punctures; frontal line absent; occipital carina complete; POL: 5; OL: 3; OOL: 4; OPL: 3.5; TL: 4.5; pronotum hairy, rugose, with posterior surface smooth and shiny; posterior surface of pronotum shorter than scutum (5:14); pronotal tubercles reaching the tegulae; scutum, scutellum and metanotum shiny, smooth, punctate, without sculpture among the punctures; notauli incomplete, reaching approximately 0.3 length of scutum; propodeum reticulate rugose, with a strong transversal keel between dorsal and posterior surface; posterior surface with two complete longitudinal keels; median area shiny, smooth, punctate, without sculpture among the punctures; lateral areas rugose; forewing hyaline, without dark transversal bands; distal part of stigmal vein shorter than proximal part (4:6); fore tarsal segments in the following proportions: 5-2-3-8.5-15; enlarged claw (Fig. 1A) with a proximal prominence bearing a long bristle; segment 5 of front tarsus (Fig. 1A) with two rows of approximately 29 long lamellae without interruption as far as the distal apex; tibial spurs 1, 1, 2.

♂. Unknown.

Remarks. *A. maurum* is closely related to *A. completum* Olmi, 1989; in *A. maurum*, however, the median area of the propodeum is shiny and smooth (dull and rugose in *A. completum*), the antennae are more thickened (more slender in *A. completum*), the lamellae of the 5th fore tarsal segment are longer (shorter in *A. completum* (Fig. 27C in Olmi 1989)), the 4th fore tarsal segment is much longer than the 1st (in *A. completum* the fore tarsal segment 4 is approximately as long as 1).

For the above morphological characteristics *A. maurum* can be inserted in the key to the females of the Australian *Anteon* published by Olmi (1989) at couplet 16, as follows:

16. Posterior surface of pronotum approximately 0.5 as long as scutum; notauli short, reaching approximately 0.3-0.5 length of scutum .... 16'.
– Posterior surface of pronotum as long as, or almost as long as scutum; notauli more than 0.5 as long as scutum .... 17.

16'. Antennae more thickened, with segment 9 less than twice as long as broad; median area of the propodeum shiny and smooth; lamellae of segment 5 of front tarsus very long (Fig. 1A); segment 4 of front tarsus much longer than segment 1. .... 65. *maurum*, spec. nov.
– Antennae less thickened, with segment 9 more than twice as long as broad; median area of the propodeum dull and rugose; lamellae of segment 5 of front tarsus short (Fig. 27C in Olmi 1989); segment 4 of front tarsus approximately as long as segment 1 .... 53. *completum* Olmi, 1989

17. Body totally testaceous .... 50. *niuense* Olmi, 1989
– Body almost totally black .... 46. *walesense* Olmi, 1987

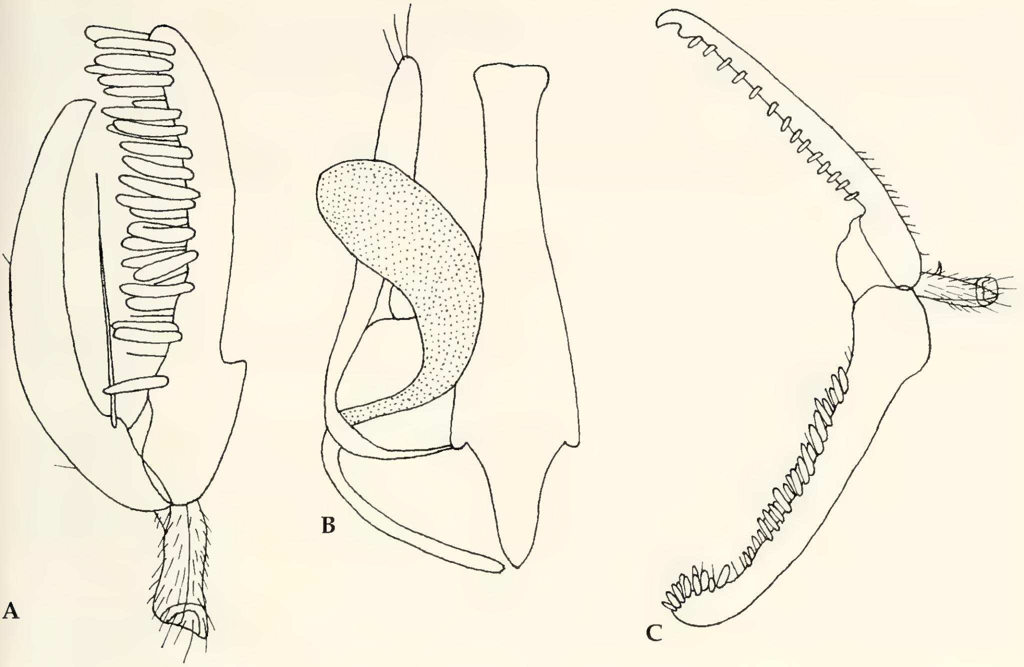

Fig. 1. A. Chela of *Anteon maurum*, spec. nov. (holotype). **B.** ♂ genital armature of holotype of *Anteon zborowskii*, spec. nov. (left half). **C.** Chela of *Dryinus zborowskii*, spec. nov. (holotype).

Anteon zborowskii, spec. nov.
Fig. 1B

Types. Holotype: ♂, Australia, Queensland, 13 km E by S Weipa, 12°40'S 143°00'E, Malaise trap, 15.XI.-16.XII.1993, P. Zborowski coll. (CB).

Description

♂ holotype. Fully winged; length 1.87 mm; head black, with mandibles testaceous; antennae testaceous; thorax and propodeum black; gaster brown; legs testaceous, with hind coxae brown; antennae not thickened distally; antennal segments in the following proportions: 9-4-4-5-5-5.5-5-5-5-7; head shiny, punctate, without sculpture among the punctures; anterior half of frons very strongly punctate, almost reticulate rugose; frontal line absent; occipital carina complete; POL: 5.5; OL: 3; OOL: 3; OPL: 2; TL: 2; scutum, scutellum and metanotum shiny, smooth, finely punctate, without sculpture among the punctures; notauli incomplete, reaching approximately 0.3 length of scutum; propodeum dull, with a strong transversal keel between dorsal and posterior surface; posterior surface without longitudinal keels, with lateral areas dull and rugose and with central area shiny, smooth and without sculpture; forewing hyaline, without dark transversal bands; distal part of stigmal vein much shorter than proximal part (2:7); genital armature (Fig. 1B) with a long dorsal process; parameres without an inner pointed process; tibial spurs 1, 1, 2.

♀. Unknown.

Remarks. The species is named in honour of the collector of the holotype, P. Zborowski. *Anteon zborowskii* is closely related to *A. tasmanianum* Olmi, 1984; in *A. zborowskii*, however, the genital armature shows a long dorsal process (Fig. 1B), with distal apex curved; this process is not present in *A. tasmanianum* (Fig. 379 in Olmi 1984).

In the key to the males of the Australian *Anteon* proposed by Olmi (1989) *A. zborowskii* can be inserted at couplet 19, as follows:

19. Posterior surface of propodeum with lateral areas dull and reticulate rugose; central area smooth and shiny .... 19'.
– Posterior surface of propodeum fully dull and reticulate rugose .... 20.

19'. Genital armature with a long dorsal process (Fig. 1B) .... 66. *zborowskii*, spec. nov.
– Genital armature without a long dorsal process (Fig. 379 in Olmi 1984) .... 36. *tasmanianum* Olmi, 1984

Anteon yasumatsui Olmi, 1984

Anteon yasumatsui Olmi, 1984: 424.
Anteon fijianum Olmi, 1984: 569 (new synonymy).
nec *Anteon fijianum* Olmi: Olmi, 1989: 228 (male).

Anteon fijianum Olmi, 1984 was described on the basis of ♀ specimens only. Apparently this was the only species of *Anteon* living in the Fiji Islands (Olmi 1990). After the original description of *A. fijianum* I examined a male specimen of *Anteon* from 15 km N Queen's Hwy (Fiji Islands, Viti Levu Island, Namosi Rd.). This ♂ specimen was considered the opposite sex of the ♀♀ of *A. fijianum*, mainly because no other species of *Anteon* Jurine was considered living in the Fiji Islands (♀♀ and ♂♂ are so different in the genus *Anteon* that often it is impossible to recognize the opposite sexes). The description of that ♂ was given by Olmi (1989: p. 228).

At the same time the Oriental species *Anteon yasumatsui* Olmi, 1984 was also found in the Australian region (Caroline Islands, Yap Island, Kolonia) (Olmi 1989: p. 216). This record allowed for the insertion of both the above species in the key to the ♂♂ of the Australian *Anteon* (Olmi 1989: pp. 231-233). The two ♂♂ apparently were distinctly identifiable, mainly because the head of the ♂ of *A. yasumatsui* was granulated and that of the ♂ of *A. fijianum* (the ♂ described above) was punctate and without sculpture among the punctures. The sculpture of the propodeum of the two ♂♂ was even different.

The separation between the above two species was apparently demonstrated.

Recently, however, I examined in LA a small series of ♀ and ♂ specimens from Suva (Viti Levu I., Fiji Is.). The ♂ specimens distinctly show a fully granulated head, as in the head of the ♀♀. Therefore, I considered these ♂ specimens the true opposite sex of the ♀♀ of *A. fijianum*. A comparison between the ♀♀ and ♂♂ of *A. yasumatsui* and *A. fijanum* demonstrated that the two species were synonyms. *A. yasumatsui* has priority over *A. fijianum*.

Presently *A. yasumatsui* Olmi (= *fijianum* Olmi) is known from the following countries: India, Thailand, Malaya, Indonesia, Taiwan, Caroline Islands, Fiji Islands, Australia.

The ♂ specimen described by Olmi (1989: p. 228) as the ♂ of *A. fijianum* belongs, therefore, to another new species, described below.

Anteon vitiense, spec. nov.

Anteon fijianum Olmi: Olmi, 1989: 228 (♂).

Types. Holotype: ♂, Fiji Islands, Viti Levu Island, Namosi Rd., 15 km N of Queen's Hwy, on Cyathea, 3.-7.XI.1981, W. C. Gagne coll. (B).

Description

♂. Fully winged; length 1.37 mm; black; mandibles testaceous; antennae brown, with segment 1 testaceous; legs brown, with fore tibiae and fore trochanters testaceous; antennae not distally thickened; antennal segments in the following proportions: 6-3.5-3.5-4.5-4.5-4.5-4.5-5-5-7; head shiny, smooth, finely punctate, without sculpture among the punctures; frontal line complete; occipital carina complete; POL: 4.5; OL: 2.5; OOL: 4; OPL: 2; TL: 3; scutum, scutellum and metanotum shiny, smooth, finely punctate, without sculpture among the punctures; notauli incomplete, reaching approximately 0.5 length of scutum; propodeum reticulate rugose, with a strong transversal keel between dorsal and

posterior surface; posterior surface without longitudinal keels, sculptured by areolae very large; forewing hyaline, without dark transversal bands; distal part of stigmal vein much shorter than proximal part (3:5); parameres (Fig. 29 F in Olmi 1989) without a distal inner pointed process; tibial spurs 1, 1, 2.

Remarks. *A. vitiense* can be easily inserted in the key to the ♂♂ of the Australian *Anteon* proposed by Olmi (1989, p. 233), because 26. *fijianum* Olmi can be replaced by 67. *vitiense*, spec. nov.

Dryinus zborowskii, spec. nov.

Fig. 1C

Types. Holotype: ♀, Australia, Queensland, 12 km SSE of Heathlands, 11°51'S 142°38'E, closed forest, FIT 2, ANIC 1252, 25.VII.-21.VIII.1992, P. Zborowski & J. Cardale coll. (CB). – Paratypes: 1♀, same label data, closed forest, FIT 2, ANIC 1250, 7.VI.-25.VII.1992, P. Zborowski & E. Nielsen coll. (OL).

Description

♀. Fully winged; length 5.18-5.62 mm (holotype: 5.62 mm); head black, with mandibles, part of clypeus, genae and a short narrow stripe along the orbits near the antennal sockets testaceous; antennae brown, with segments 1-2 testaceous; thorax and propodeum black, with sides of pronotum testaceous; gaster brown; legs testaceous, with part of coxae, trochanters, femora and tibiae brown; antennae distally thickened; antennal segments in the following proportions: 12-6-42-21-18-11-9-8-8-10; head flat, shiny, punctate, without sculpture among the punctures; numerous areolae are visible along the orbits, where also a few irregular keels are visible; in the anterior half of the frons a few transversal keels are visible; frontal line complete; in the paratype even the vertex is slightly rugose; occipital carina complete; occiput smooth, shiny, without sculpture; temples absent; POL: 4; OL: 2; OOL: 8; OPL: 1; pronotum humped, crossed by a strong posterior transversal impression; posterior collar short; a slight anterior transversal impression even visible; pronotum shiny, almost fully smooth and without sculpture; a few slight striae visible on the sides around the disc; pronotal tubercles not reaching the tegulae; scutum shiny, totally sculptured by numerous parallel longitudinal keels; notauli distinct and complete, posteriorly separated; scutellum and metanotum dull, granulated and rugose; propodeum dull, reticulate rugose; posterior surface of propodeum without longitudinal keels; forewing with three dark transversal bands; distal part of stigmal vein longer than proximal part (21:7); marginal cell open; fore tarsal segments in the following proportions: 22-4-9-18-30; enlarged claw (Fig. 1C) with a subapical tooth and a row of 14 lamellae; segment 5 of front tarsus (Fig. 1C) with two rows of 25 lamellae; distal apex with a group of approximately 12 lamellae; tibial spurs 1, 1, 2.

♂. Unknown

Remarks. The species is named in honour of one of the collectors of the typical series, P. Zborowski. For the presence of a subapical tooth in the enlarged claw (Fig. 1C) and the visible notauli, *D. zborowskii* belongs to the *Dryinus pallidus* (Perkins) group (sensu Olmi 1993); this group includes species belonging to the old genera *Dryinus* Latreille, 1804 and *Richardsidryinus* Moczar, 1965). *D. zborowskii* is very closely related to *D. wasbaueri* Olmi, 1993.

In the key to the ♀♀ of the Australian *Dryinus* proposed by Olmi (1989, with modifications by Olmi 1993), *D. zborowskii* can be inserted at couplet 27, near *D. wasbaueri* Olmi, 1993 as follows:

26. Pronotum smooth, shiny, almost hairless, without sculpture or with a few keels around the disc .... 27.
– Pronotum not smooth and shiny, but sculptured by numerous keels around the disc .... 28.

27. Head shiny, without sculpture, or punctate and without sculpture among the punctures .... 27'.
– Head at least partly dull and rugose, with a few irregular keels .... 27''.

27'. Head with OPL as long as POL; posterior collar of pronotum yellow .... 20. *glaber* Olmi, 1984
– Head with OPL shorter than POL (posterior ocelli very near the occipital carina); posterior collar of pronotum black .... 21. *australianus* Olmi, 1984

27''. Scutum with median area granulated and not sculptured by numerous parallel and longitudinal keels; head totally dull and reticulate rugose, with a few irregular keels on the frons .... 34. *wasbaueri* Olmi, 1993

– Scutum totally sculptured by numerous parallel longitudinal keels; head shiny, with frons almost totally punctate and without sculpture among the punctures; head rugose only around the orbits, where a few irregular keels are visible; a few transversal keels are visible even in the face, near the clypeus .... 35. *zborowskii*, spec. nov.

Acknowledgments

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Nandeva, gen. nov., a new genus of Chironomini

(Insecta, Diptera, Chironomidae)

Sofia Wiedenbrug, Friedrich Reiss and **Ernst Josef Fittkau**

Wiedenbrug, S., Reiss, F. & E. J. Fittkau (1998): *Nandeva*, gen. nov., a new genus of Chironomini. (Insecta, Diptera, Chironomidae). – Spixiana **21/1:** 59-68

Nandeva, a new genus of Chironomini is established. *Nandeva gaucha*, spec. nov. is described based on the pupa and male imago, two additional species, *Nandeva tropica*, spec. nov. and *N. chilena*, spec. nov. are described based on the pupae only. The larval stages are unknown. *Nandeva gaucha*, spec. nov. is found in southern Brazil, *N. tropica*, spec. nov. in the Amazon basin and in Rio de Janeiro State, and *N. chilena*, spec. nov. in southern Chile.

Sofia Wiedenbrug, Friedrich Reiss and Ernst Josef Fittkau. Zoologische Staatssammlung. Münchhausenstr. 21. D-81247 München. Germany.

Introduction

The fauna of chironomids in tropical South America is extraordinarily rich in species, hundreds of undiscovered species can be expected to exist (Spies & Reiss 1996). In 1994 the authors found an unknown pupal exuviae morphotype in small rivers of a mountainous region in southern Brazil. Fortunately, reliably associated adults were also found allowing us to describe the new genus. Two other morphotypes in the pupal stage, found in the collection of the Zoologische Staatssammlung München, are included in the genus and described as species. One of the latter was outlined by Ospina Torres (1992) as a new "genus 30".

The larvae are unknown, and for this reason the diagnoses of the genus and species remain incomplete, and statements on the species' ecology are not possible.

Terminology used follows Saether (1980). The type material is deposited in the Zoologische Staatssammlung München (ZSM), Germany, Coleção Entomológica do Instituto Oswaldo Cruz (IOC), Rio de Janeiro, Brazil, and in the personal collection of Dr. F. Reiss.

Nandeva, gen. nov.

Type species. *Nandeva gaucha*, spec. nov., by present designation.

Etymology. This genus is dedicated to the native Indian group that formerly lived in the region where the type material was found.

Description

Adult ♂. Based on the type species and a few specifically unassigned adult males (see *Nandeva* spec.). Small species, body length about 2 mm.

Head. Antenna with 13 flagellomeres, fully plumose. AR less than 0.4. Eyes bare, reniform. Frontal setae merging into orbitals. Clypeus triangular, moderately setose. Palp 5-segmented.

Thorax (Fig. 1A). Antepronotal lobes slightly tapered dorsally, ending very distant from each other below apex of mesonotum. Scutum slightly overreaching antepronotum, tubercle lacking. Antepronotals, acrostichals, dorsocentrals, prealars and scutellars present. Dorsocentrals proximally uniserial, distally biserial; acrostichals biserial; scutellars biserial, the oral row of smaller setae.

Wing (Fig. 1B). All veins with setae, membrane with setae and trichia. Anal lobe absent. Squama with 2 to 4 setae. Costa not extended beyond R_{4+5}, ending distal to Cu_1.

Legs. Apex of fore tibia (Fig. 2C) with a short scale bearing a long and slightly curved spur. Mid and hind tibia (Fig. 2D, E) with separate combs, inner comb bearing a longer spine than the outer.

Hypopygium (Figs 3A, B). Anal tergite bands fine, well separated, extending over ⅔ of the anal tergite. Basal-lateral setae of anal tergite long and strong, median anal tergite setae absent. Many (12-22) long setae arranged around the anal point insertion. Anal point long, narrow, parallel-sided and curved to ventral. Superior volsella without microtrichia, digitiform, with a strong broadened base, with 0-1 basal-median, 1-3 basal-lateral setae and three short setae at the apex, sometimes one of the latter near middle of median margin. Median volsella absent. Inferior volsella parallel-sided or narrowed in apical ⅓; dorsal surface with medially directed macrotrichia and few long setae; two long, slightly curved setae apically, one of them oriented to dorsal. Median contour of gonocoxite with 4 long setae. Gonostylus cylindrical, slender, microtrichiose, except on basal ⅔ of the median contour; gonostylus with anteriorly directed short setae on the medially oriented part of the distal half, long setae absent in this region.

♀ known, but not described.

Pupa. Length 2-3 mm.

Color. Exuviae greyish.

Cephalothorax (Figs 4A, B). Frontal setae 0, postorbitals 0, median antepronotals 2, lateral antepronotals 1 and 1 pit, prealars 0, precorneals 2 and one pit, dorsocentrals 4 in two pairs. Thoracic horn and cephalic tubercles absent. Fore and mid leg sheath straight between and reaching beyond wing sheaths. Hind leg sheath S-shaped, lying under the wing sheath as in Type 5, "Lepidopodites", of Brundin (1966: fig. 627 and p. 430).

Abdomen (Fig. 5). Pedes spurii A and B absent. Tergites: I bare. II-V each with postero-median row of hooklets, rows slightly longer on segment IV. II-VII each with an oral pair of broad, rectangular spine patches. The latter can be fused in *N. chilena*. Tergites II-VIII irregularly covered with shagreen. Segment IX sometimes with one pair of setae. Anal lobe reduced, fringe absent. Male genital sac extending beyond the anal lobe.

Larva. Unknown.

Differential diagnosis. The following combination distinguishes the adults of *Nandeva* from other Chironomini: Superior volsella with 0-1 basal-median setae, 1-3 basal-lateral and three short setae at the apex, sometimes one of the latter near the middle of median margin; median volsella and median anal tergite setae absent; anal point parallel-sided and slender; wing with membrane and veins hairy, squama with 2-4 setae, anal lobe absent.

The presence of paired patches of spines on tergites II-VII, and of hooklet rows from II-V in combination with the absence of an anal lobe fringe, anal spur or comb, thoracic horn, and of pedes spurii A and B will distinguish the pupae of *Nandeva* from all other Chironomini.

Nandeva gaucha, spec. nov.

Types. Holotype: 1 pharate ♂ pupa, BRAZIL, Rio Grande do Sul, município Bom Jesus, X.1961, leg. E. J. Fittkau (ZSM). – Paratypes: BRAZIL, Rio Grande do Sul, São Francisco de Paula, Arroio dos Carros, XI.1994, leg. S. Wiedenbrug, 14♂♂, 7 pupal exuviae (ZSM) and 3♂♂, 6 pupal exuviae (IOC); 1♂, Arroio da Estação Ecológica da Puc, XI.1994, leg. S. Wiedenbrug (IOC).

Etymology. Named from the Brazilian word for the natives of Rio Grande do Sul.

Description (Measurements given as means in µm).
♂ (Genus characters mostly not repeated).

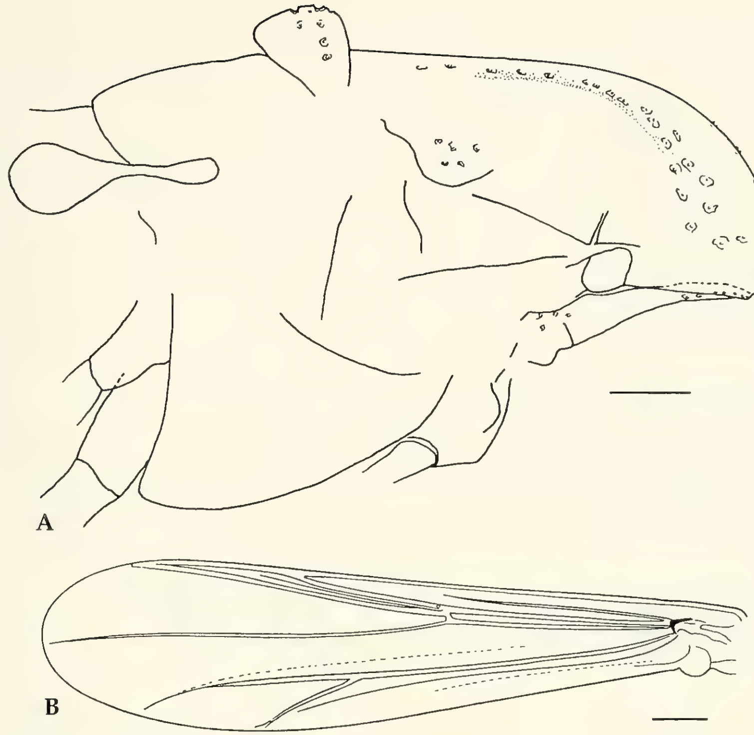

Fig. 1. *Nandeva gaucha*, spec. nov. Adult ♂. **A.** Thorax, lateral. **B.** Wing, figured without setation. Scales: 100 µm.

Color (in alcohol). Thorax brown, scutellum pale; abdominal tergites (Fig. 2A) II-V and VIII brown, VI and VII brown with a clear postero-median mark, tergal setae originating from small pale spots. Abdominal sternites pale.

Length. Thorax 670 (620-780, n=10). Abdomen 1510 (1390-1810, n=9).

Head. Frontal setae 4-7, verticals 2-4. AR 0.23 (0.19-0.30, n=12). Antenna with one subapical seta present. Clypeus with 12 setae (9-16, n=15). Lengths of palpal segments 1-5 (n=12): 30, 40, 230, 210, 230.

Thorax (Fig. 1A). Lateral antepronotals 5 (3-8, n=11), median antepronotals 7 (5-9, n=12), acrostichals 20 (17-22, n=10), dorsocentrals 20 (18-25, n=16), prealars 6 (5-7, n=16), scutellars 12 (9-15, n=12).

Wing (Fig. 1B). Length 1170 (1100-1240, n=10), width 310 (290-330, n=10). Squama with 3 setae (n=11). Brachiolum with 5 setae; number of setae on C about 150, R 28, R_1 28, R_{4+5} 25, M 13, M_{1+2} 22, Cu 40, M_{3+4} 31, Cu_1 14 (n=1).

Legs. Spurs and combs as in Figs. 2C, D, E. Sensilla chaetica and pulvilli absent. Two types of setae on the last tarsomeres, one straight, the other curved and relatively broad.

Length of leg segments and proportions:

	Fe	Ti	Ta1	Ta2	Ta3	Ta4	Ta5	LR	BV	SV
PI	290	280	220	140	110	90	50	0.83	2.04	2.44
n	12	12	2	2	2	2	2			
PII	330	280	170	110	100	60	50	0.62	2.42	3.50
n	13	13	3	3	3	3	3			
PIII	330	360	200	150	140	90	50	0.57	2.05	3.29
n	15	15	3	3	3	3	3			

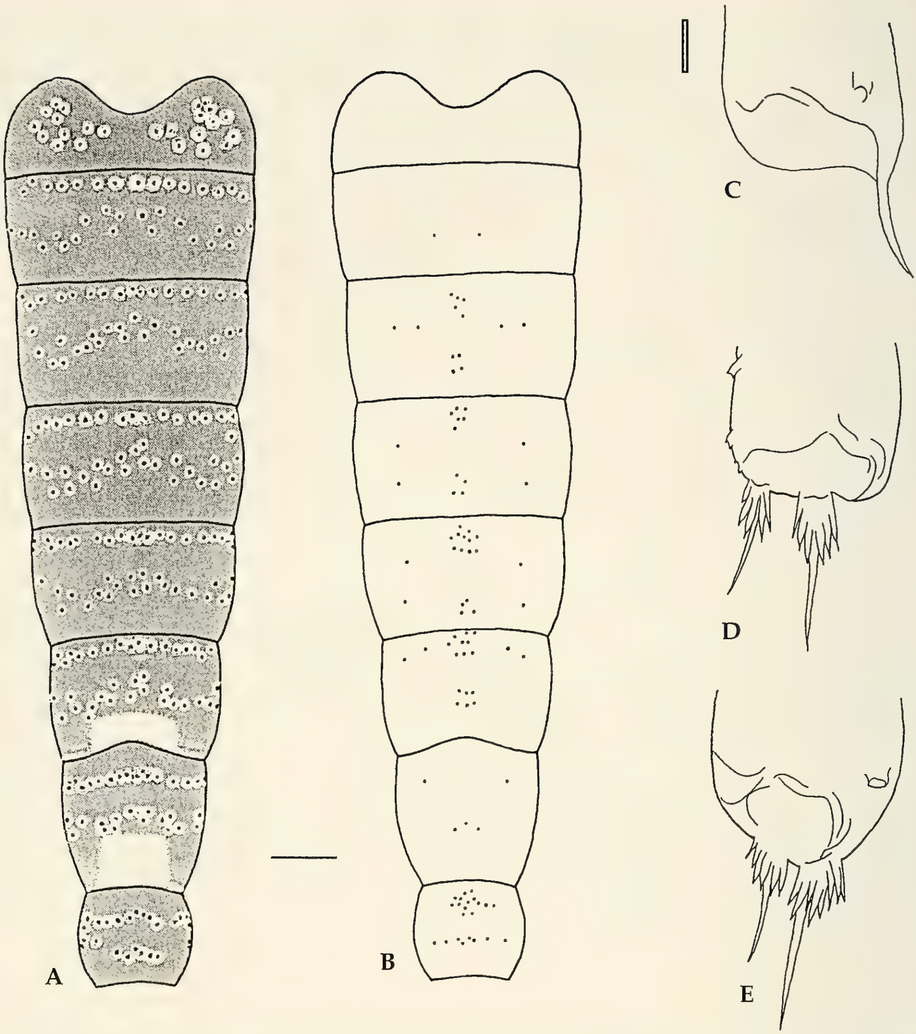

Fig. 2. *Nandeva gaucha*, spec. nov. Adult ♂. **A.** Tergites I-VIII. **B.** Sternites I-VIII. **C.** Fore tibial apex. **D.** Mid tibial apex. **E.** Hind tibial apex. Scales: simple 100 µm, double 10 µm.

Abdomen (Figs 2A, B). Tergite I with scattered setae, II-VIII each with a row of basal setae. Two irregular median transverse rows of setae each from segment II-VI or VII, one transverse median row on VIII. Sternite II with a median pair of setae. SIII-VI each with 2 median patches and a pair of lateral setae as in Fig 2B. VII with 1 median patch and one lateral seta. VIII with an anterior patch and a posterior transverse row of setae.

Hypopygium (Figs 3A, B). Gonocoxite length 130 (100-180, n=16), gonostylus length 180 (170-190, n=16). HR 0.73. About 17 (12-22, n=7) long setae in a field around anal point insertion. Superior volsella with one basal seta medially, two (rarely three) laterally, and three short apical setae; distal half of superior volsella ventrally excavated (Fig. 3C). Inferior volsella basally broad, apically narrow with outer margin slightly S-shaped. Dorsal surface with macrotrichia, about 7 (5-8, n=6) long, medially directed setae, and two apical setae, one directed to caudal, the other to dorsal. Ventral surface with short, caudally directed microtrichia, one seta directed laterally, one seta on the median margin, and one or two on the lateral margin. Gonostylus ventrally with 13 (11-16, n=6) short, anteriorly directed setae on the medially oriented part of the distal half. Sternapodeme M-shaped.

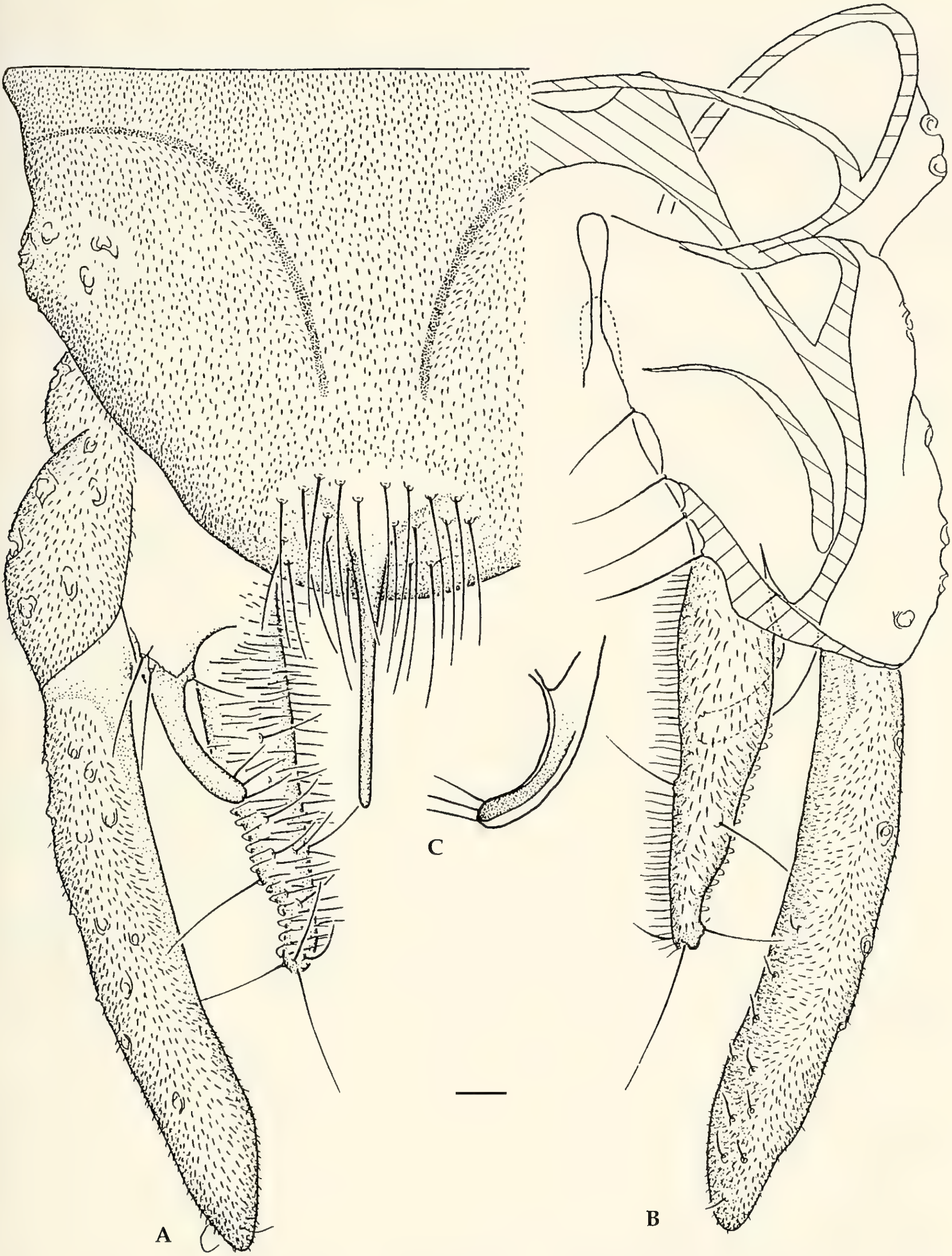

Fig. 3. *Nandeva gaucha*, spec. nov. Adult ♂. **A.** Hypopygium, dorsal. **B.** Hypopygium, ventral. **C.** Superior volsella, ventral. Scale: 10 µm.

♀ known, but not described.

Differential diagnosis. Superior volsella with 3 distal setae concentrated at the apex. Inferior volsella apically narrowed. Otherwise refer to generic diagnosis.

Pupa. (Genus characters not repeated).

Length. Thorax 740 (650-780, n=11, Figs. 4A, B); abdomen 1790 (1700-1870, n=7).

Abdomen (Fig. 5D). Setae of segments I-VIII:

	I	II	III	IV	V	VI	VII	VIII
dorsal	2+2[1]	3+2[1]	4+2[1]	4+2[1]	4+2[1]	4+2[1]	4+2[1]	1
lateral	2	2	2	2	2	2	2	1[2]
ventral	2	2	2	2	2	2	2	1[3]

[1] Additional dorsal pits not bearing setae in the specimens examined.
[2] Intersegmental between VIII and IX.
[2] and [3] Not always present.

Tergites. I bare with a posterior band of greyish polygons (Fig. 5E). II to VI with bands of polygons each ending in a black spine (Fig. 5F).

Sternites. Bare, VII and VIII with light shagreen.

Segment IX (Figs 5D, G). Tergite with anterior shagreen. Male genital sac wide in midsection, pointed at the tip.

Larva. Unknown.

Differential diagnosis. See key below.

Nandeva tropica, spec. nov.

"Gattung 30" spec. 1, "Puppenexuvien-Typ" 163, Ospina Torres 1992

Types (all pupal exuviae). Holotype: 1, BRAZIL, Amazonas, Rio Marauiá, left side affluent to upper Rio Negro, 29.I.1963, leg. E. J. Fittkau (ZSM). – Paratypes (leg. E. J. Fittkau): 2, BRAZIL, Pará, upper course of Rio Parú do Oeste, Serra Tumucumaque, near border to Surinam, 22.III.1962 (IOC); 3, Amazonas, Rio Marauiá, left side affluent to upper Rio Negro, near border to Venezuela, mountainous region Chamata, 17. and 29.I.1963 (ZSM); 1, Amazonas, Rio Marauiá, I.1963 (ZSM); 2, Amazonas, Rio Irapirapi, affluent to Rio Marauiá, border to Venezuela, 12.I.1963 (ZSM); 1, Amazonas, Igarapé Acará near Manaus, 26.VI.1961 (IOC), see Ospina Torres (1992: fig.1 and p.3); 1, Mato Grosso, Serra dos Parecis, X.1965 (ZSM); 3, Maranhão, Res. Aldeia Escalvado, 6°S, 54°W, 8.IV.1991 (IOC); 1, Rio de Janeiro, Nova Friburgo, Caledonia (reservoir), Rio Cascatinha, 24.VIII.1995 (ZSM).

Variation. 1, Amazonas, Rio Aripuana, left side affluent to lower Madeira, 16.I.1965 (ZSM); 1, Mato Grosso, Serra dos Parecis, X.1965 (ZSM); 1, Maranhão, Res. Aldeia Escalvado, 6°S, 54°W, 8.IV.1991 (ZSM).

Etymology. Named according to the known distribution of the species in South America.

Description

Pupa. (Genus characters not repeated)

Length (n=7). Thorax 661 (562-785). Abdomen 1636 (1510-1817).

Abdominal setation. 3 dorsals and 2 pits, one lateral and 2 ventral setae on segment I; II-VII as in *Nandeva gaucha;* VIII with 1 dorsal and 1 lateral or ventral (Fig. 5A). Tergites each with a posterior band of diffuse greyish spots each ending in 2 or 3 spines on TII-TV, in one or two spines on VI (Fig. 5B). Sternites bare.

Shagreen and setae present on tergite IX. Male genital sac narrow and tapered (Fig 5C).

Variation. Additional specimens, although fitting the description of *N. tropica,* differ slightly in the distribution of spines in the tergal patches. The spines from TII-III are grouped in pairs, rather than separate.

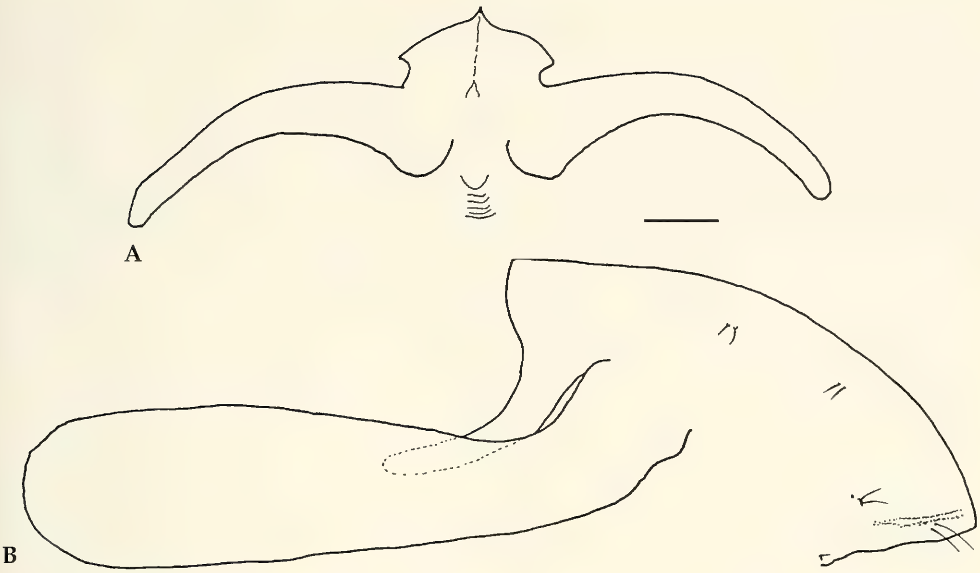

Fig. 4. *Nandeva gaucha,* spec. nov. Pupa. **A.** Frontal region. **B.** Thorax. Scale: 100 µm.

Larva, ♂ and ♀ adult. Unknown.

Differential diagnosis. See key below.

Nandeva chilena, spec. nov.

Types (all pupal exuviae). Holotype: 1, South CHILE, Lago Todos los Santos, near Peulla, in front of mouth of Rio Bonito, 5.XII.1969, leg. F. Reiss (ZSM). – Paratypes: 7, from the type locality (2 at IOC, 5 in coll. Reiss).

Etymology. Named according to the known distribution of the species.

Description

Pupa ♀. (♂ unknown); genus characters not repeated.

Length. Thorax 819 (770-861, n=4). Abdomen 2267 (2160-2379, n=7).

Abdominal setation as in *Nandeva gaucha,* but segment VIII with two pairs of ventral setae and one additional lateral.

Abdominal spine patches II-III fused or almost fused, IV-VII fused (Fig. 5H). TII-VII with a posterior band of diffuse greyish spots each ending in one spine (Fig. 5I).

Segment IX without shagreen or setae.

Larva, ♂ and ♀ adult. Unknown.

Differential diagnosis. See key below.

Nandeva spec.

In the ZSM collection there are a few additional male adult specimens considered to represent the new genus, and consequently included in the generic diagnosis. However, this material is not regarded as suitable for a full species description, especially in light of the possibility for identity with one of the species described above.

These adults significantly differ from those of *N. gaucha*, spec. nov. by possessing superior volsellae with 1 of the distal setae located far proximal of the apex, and by the inferior volsellae being distally parallel-sided.

Distribution. Up to now *Nandeva*, gen. nov. is known from the Neotropics[1]. The most northerly records are *Nandeva* spec. adults from Panama. The southernmost (*N. chilena*) are from South Chile. *N. tropica* is found in the Amazon basin: near the borders to Venezuela and Surinam, and near Manaus. *N. tropica* was also recorded in Rio de Janeiro state. *N. gaucha* is known only from Rio Grande do Sul.

Key to the known pupae of *Nandeva*

1. Abdominal tergites III-VII with the anterior spine patches fused or almost fused (Fig. 5H). Sternite VIII with 2 pairs of ventral setae. Segment IX without setae or shagreen (known only from ♀ P) .... *N. chilena*, spec. nov.
– TIII-VII with spine patches clearly separate (Figs 5A, D). Segment IX with setae and shagreen .... 2.
2. ♂ genital sac wide in midsection (Fig. 5G). Abdominal tergite I with posterior transverse band of polygons (Figs 5D, E). Similar bands on TII-VI composed of polygons each usually ending in 1 spine (Fig. 5F) .... *N. gaucha*, spec. nov.
– ♂ genital sac narrow (Fig. 5C). Tergite I band with pale polygons, or absent (Fig. 5A). Polygons in bands of TII-VI diffuse, each ending in 2-4 spines .... *N. tropica*, spec. nov.

Discussion

The absence of thoracic horn, anal lobe fringe, anal spur or comb, LS setae, and of pedes spurii A and B are reductions that could lead to the pupae being mistaken for Orthocladiinae. The presence of paired patches of spines on segment VII also, and of hooklet rows from segment II-V are considered autapomorphies for the genus. The 4 dorsal setae and 2 pits each on segments III-VII indicate the presence of originally 6 dorsal setae, one more than usually found in Chironomidae. A possible explanation is that one of the D-setae moved from an originally lateral position.

The adult characteristics show that the genus belongs to the Chironomini. In the key to the Chironominae of the Holarctic Region (Cranston et al. 1989), the males of *Nandeva* would key to *Pagastiella* Brundin, from which they differ by a wing without anal lobe, with 2-4 setae on the squama, and with hairy veins and membrane. Other marked differences are the fine anal tergite bands, narrow and parallel-sided anal point, and the absence of median anal tergite setae.

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[1] After completion of this manuscript Dr. Peter S. Cranston found a new species of *Nandeva* in Australia, which will be described in a future publication.

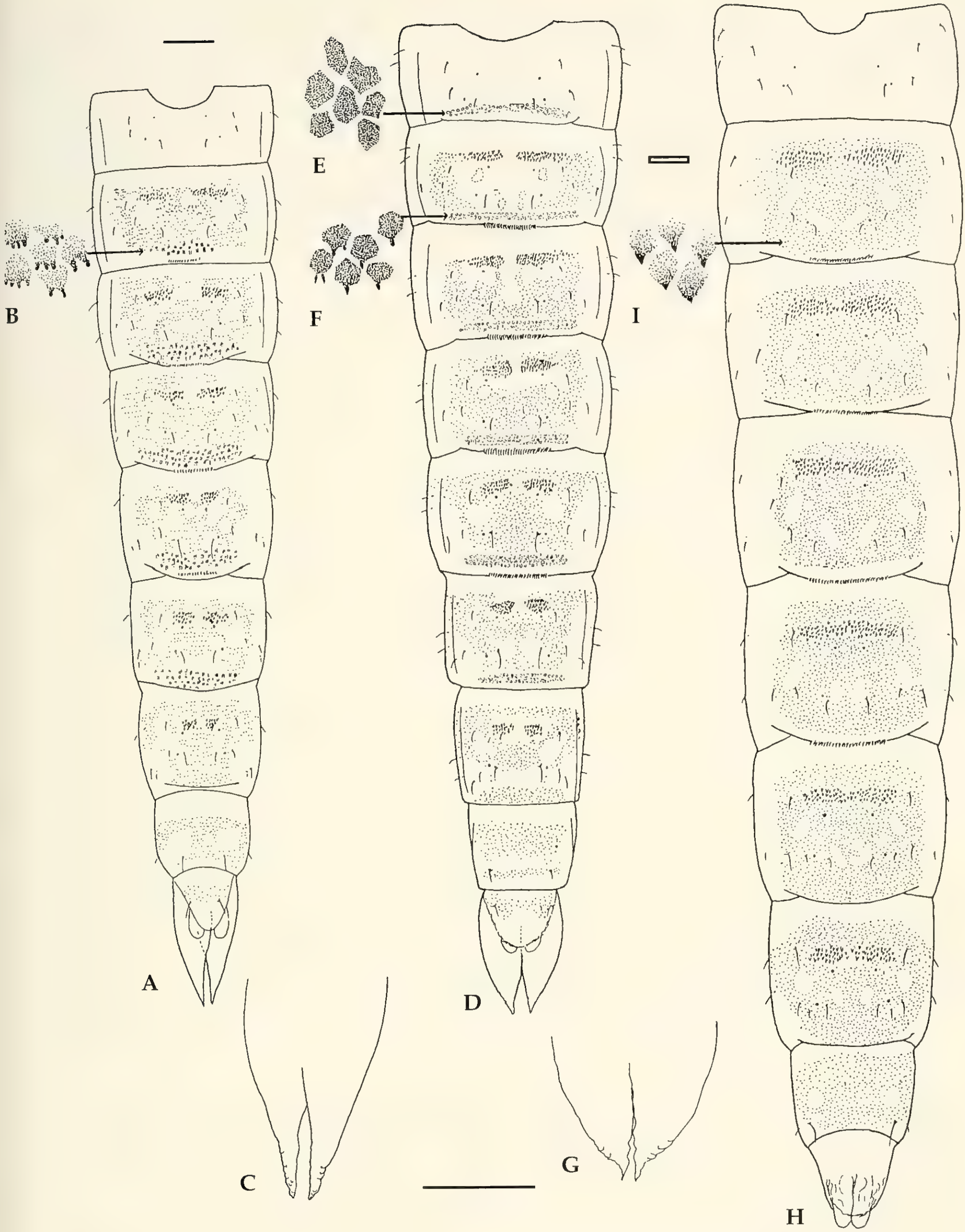

Fig. 5. A-C. *Nandeva tropica*, spec. nov. **A.** Abdomen, dorsal. **B.** Posterior spots on segment II. **C.** ♂ genital sac, ventral. **D-G.** *Nandeva gaucha*, spec. nov. **D.** Abdomen, dorsal. **E.** Posterior polygons on segment I. **F.** Posterior polygons on segment II. **G.** ♂ genital sac, ventral. **H-I.** *Nandeva chilena*, spec. nov. **H.** Abdomen, dorsal. **I.** Posterior spots on segment II. Scales: simple 100 µm, double 10 µm.

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Möglichkeiten und Grenzen des Einsatzes von Bodenfallen in der synökologischen Forschung

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Kuschka, V. (1998): Chances and limitations of the application of pitfall-traps in the synecological research. – Spixiana **21/1:** 69-94

Pitfall-trapping is a measuring method for the activity abundance of active walking, trapable semaphoronts of the ground surface. Its results are influenced in different ways by the following mistakes: Cannibalism and predation, escape, attractive or repellent signal-effects, artifical stimulated activity, effects of competing and empty-catching traps, hindrance-effects of the trap-border, immission and importation of organisms into the trap. These mistakes can be minimized by corresponding precautions and the application of special types of traps if the pitfall-trapping is limitated to groups of semaphoronts it is suitable for. The so-called "fraction trap" with propantriol as preservative is especially suitable for synecological questions. The abundance can be calculated from the activity abundance for semaphoronts ≥ 6 mm using the separate measured radius of action. The pitfall-trapping is to be arranged in a harmonized way into the complex of synecological methods.

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1 Einführung

Der Bodenfallenfang hat sich in den vergangenen Jahrzehnten als eine Standardmethode der Ökologie, Faunistik und angewandter Disziplinen etabliert. Zahlreiche Vorteile, die hier nicht wiederholt werden sollen, verhalfen dieser automatischen Fangmethode zu solch breiter Anwendung. Verschiedene Autoren weisen aber auch auf deren Grenzen hin (Bombosch 1962, Skuhravy 1964, Goddard 1979 u.a.). Anliegen dieser Publikation ist es, die realen Möglichkeiten, potentielle Fehlerquellen und Grenzen des Einsatzes dieser Methode in der synökologischen Forschung herauszuarbeiten.

Die Synökologie untersucht die höchste Stufe biotischer Organisation, das Ökosystem (als dialektische Einheit von Biozönose und Biotop). Da alle Organismen der Biozönose Populationen bzw. Teilpopulationen angehören, besteht ein enger Zusammenhang zwischen populations- und synökologischen Problemstellungen. Synökologische Forschung führt oftmals über vier Erkenntnisstufen:

1. Abgrenzung und beschreibende Inventarisierung der Biozönose
2. qualitative Einordnung der Semaphoronten in das Netz trophischer Beziehungen der Biozönose
3. quantitative Beschreibung der Raum- und Zeitstruktur sowie der Dynamik des Ökosystems und Bilanzierung des Stoff- und Energieflusses im Ökosystem
4. Darstellung kausaler Zusammenhänge und Ökosystemmodellierung

(H. J. Müller 1984).

Welchen Beitrag vermag der Bodenfallenfang dazu zu leisten? Die klassische Bodenfalle (zu abgeleiteten Methoden siehe Kap. 5) fängt laufaktive, "fallengängige" Tiere (s. Kap. 4) des Epigaions (Dunger

& Fiedler 1989). Das Epigaion ist eigentlich keine eigenständige Stratozönose, sondern repräsentiert die Teile der edaphischen und hypergäischen Fauna, die die Bodenoberfläche als Grenzbereich zwischen Boden und Atmosphäre frequentieren.

An dieser Stelle ist anzumerken, daß die Definition der Bodenoberfläche selbst nicht ganz unproblematisch ist. Besonders in biomassereichen Sumpf- und Salzwiesen kann sich eine derartige Feinschichtung von Streu und Vegetation im Bodenraum herausbilden, die praktisch einer vertikalen Abfolge mehrerer "Bodenoberflächen" gleichkommt (Heydemann 1961a, Kuschka 1986). Noch problematischer ist die Abgrenzung der Bodenoberfläche auf geröllreichen Hängen (Růžička 1988b). Aber selbst eine wenig differenzierte Nadelstreu stellt keine zweidimensionale Fläche im Sinne der Euklidischen Geometrie dar. Die tatsächlich im Einzugsbereich der Fallen liegende "Fang-Oberfläche" ist von der "Bodenoberfläche" zu unterscheiden. Bei zahlreichen Arten ist auch nur ein Teil der Population auf der Bodenoberfläche aktiv, während sich der Rest in anderen Straten bewegt. So findet man viele Carabidenlarven und einige Carabidenimagines (Arndt & Arndt 1987, Loreau 1987, J. K. Müller 1986) im Porensystem des Bodens, *Calosoma* (Arndt & Arndt 1987) und Kanker sind auch wesentlich in der Vegetation aktiv.

Damit sind die Zielgruppe und der räumliche Ausschnitt des Ökosystems, die mittels Bodenfallenfang erfaßbar sind, grob umrissen. Es wird deutlich, daß dieser nur ein Baustein des synökologischen Methodenkomplexes ist. Von Bodenfallen sind vor allem folgende Ergebnisse zu erwarten:

1. Sie erfassen innerhalb ihres Wirkungsbereiches einen Teil des Arteninventars der Biozönose. Über eine entsprechende Art-Areal-Kurve lassen sich die Gesamtartenzahl und damit Artendichte und Diversität dieser Zielgruppe abschätzen (Dunger & Fiedler 1989, Uetz & Unzicker 1976, Růžička 1987). Eine vollständige Artenliste wird allerdings häufig wegen des dazu erforderlichen hohen Arbeitsaufwandes nicht erreicht (Bombosch 1962, Adis 1979).
2. Die so dokumentierte räumliche Koexistenz verschiedener Arten ist ein Hinweis auf deren mögliche trophische bzw. kompetitive Beziehungen (J. K. Müller 1984, Uetz & Unzicker 1976, Růžička 1987, Heydemann 1961a).
3. Tages- und jahresperiodische sowie langfristige Fluktuationen und Oszillationen der Populationsparameter, die sich im Fangergebnis niederschlagen, sind Ausdruck der zeitlichen Struktur des Ökosystems und dessen Dynamik (J. K. Müller 1984, Adis 1979, Obrtel 1971, G. Müller 1978, Heydemann 1956a, 1961a, Grimm et al. 1974). Durch entsprechende Methoden (Sektorfallen, Zeitfallen usw.) sind Aussagen über Immigration und Emigration von Teilpopulationen, deren Aktivitätsphasen und demographische Daten zu gewinnen (J. K. Müller 1984, Adis 1976, 1979, Grimm et al. 1974, Heydemann 1961b, Dunger & Fiedler 1989).
4. Der quantitative Fang repräsentativer Populationsteile vieler Arten ermöglicht Rückschlüsse auf deren biozönotisch-produktionsbiologische Bedeutung und Raumbeherrschung (Heydemann 1961b, Honek 1988, Schwerdtfeger 1975, J. K.Müller 1984, Obrtel 1971). Die quantitative Auswertung von Bodenfallenfängen liefert somit einen Teil der Basisdaten zur Analyse und Modellierung terrestrischer Ökosysteme.

2 Material und Methode

In die Vorbereitung dieser Arbeit wurden die Fallenergebnisse der Jahre 1985/86 aus dem Naturschutzgebiet (NSG) "Gülper See" bei Rathenow/Brandenburg (Kuschka 1986) und der Jahre 1988/89 aus dem Flächennaturdenkmal (FND) "Rutsch" bei Flöha/Sachsen einbezogen. Im NSG "Gülper See" waren 12 Formalin- und 16 Lebendfallen aus Glas insgesamt 14936.0 und 17731.8 Fangstunden im Einsatz. Außerdem wurde hier erstmals die "Fraktionsfalle" (s. Kap. 5.) 2188.5 Fangstunden getestet. Im Jahre 1988 waren im FND "Rutsch" 21 "Fraktionsfallen" insgesamt 26691.5 Stunden fängig. Die Untersuchungen im Frühjahr 1989 dienten speziell dem Vergleich von glycerolbestückten Glasfallen und "Fraktionsfallen" (je 15) (Glasfallen: 19.313 Fangstunden; "Fraktionsfallen": 18810 Fangstunden). Die Theoretische Fängigkeit (nach Kuschka et al. 1987) erreichte folgende Werte:

Lebendfallen im NSG "Gülper See"	63.94
"Fraktionsfallen" im FND "Rutsch" 1988	84.00
"Fraktionsfallen" im FND "Rutsch" 1989	119.95

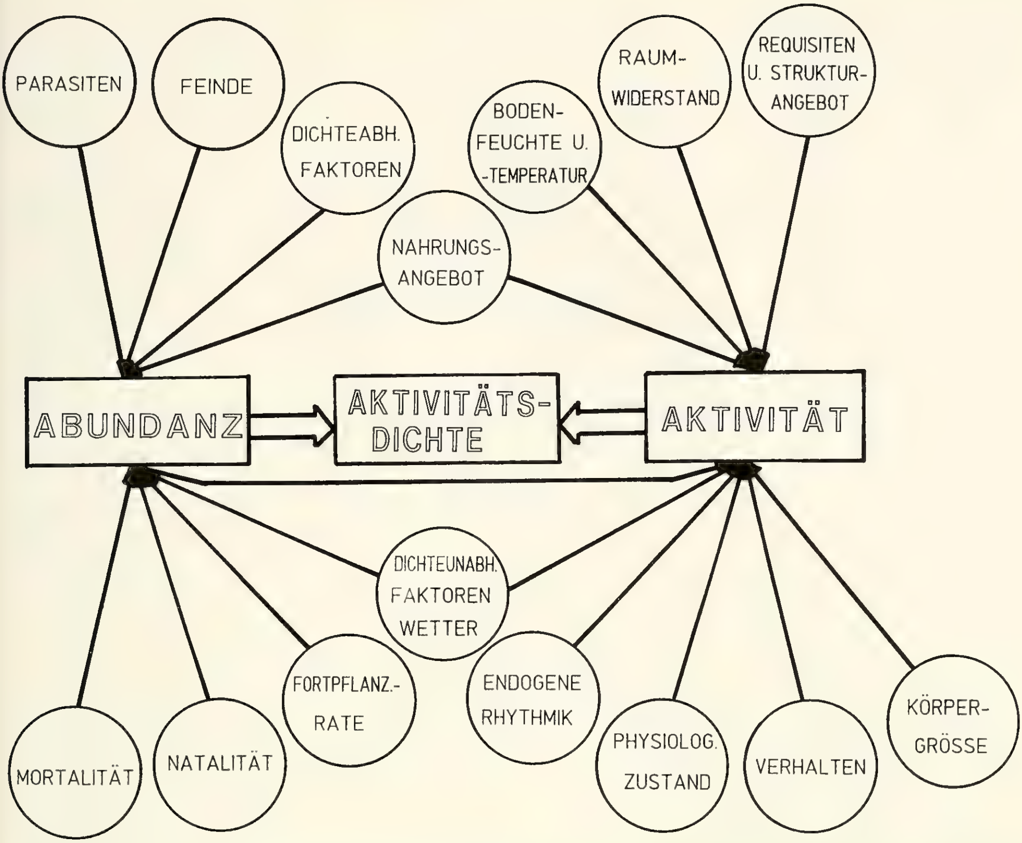

Abb. 1. Vereinfachtes Schema der Beziehungen zwischen Abundanz, lokomotorischer Aktivität, Aktivitätsdichte und exogenen sowie endogenen Einflußfaktoren.

Die Fallen im NSG "Gülper See" waren durch Dächer aus Hartfaserplatte, die im FND "Rutsch" durch Pappdächer, die mit Alkydharzfarbe gestrichen wurden, vor Niederschlag und Fallaub geschützt. In beiden Untersuchungsgebieten wurden die Aktionsradien ausgewählter Arten entsprechend der, in Kuschka et al. (1987) beschriebenen, Markierungs-Wiederfang-Methode bestimmt. Spezielle Experimente und Auswertungsmethoden zur Klärung von Detailfragen werden an entsprechender Stelle im Text beschrieben.

3 Messung quantitativer Daten mittels Fallenfang

Ein Tier wird dann in einer Bodenfalle gefangen, wenn es 1. sich auf der ("Fang-") Bodenoberfläche bewegt und 2. im Fangzeitraum den Fallenöffnungsrand überschreitet. Damit ist die Bodenfalle ein Meßinstrument zur Messung der Aktivitätsdichte (Balogh 1958, Heydemann 1961b) epigäischer, laufaktiver Tiere. Die Aktivitätsdichte einer Semaphorontengruppe wird durch deren Abundanz und lokomotorische Aktivität (meßbar als Aktionsradius) bestimmt (Abb.1) (Banerjee 1970 u.a.). Beide Größen stehen ihrerseits wiederum mit einer Vielzahl von Parametern im Zusammenhang, die hier nicht erschöpfend erläutert werden können. Die aktuelle Abundanz wird durch einen weitgehend selbstregulativen Rückkopplungsmechanismus determiniert, wie ihn Wilbert (1962) modellhaft faßte. Gegenüber der Abundanz ist die lokomotorische Aktivität, die im folgenden besonders besprochen sei, kurzfristigeren Veränderungen unterworfen. Tembrock (1982) nennt folgende Motivationen für Loko-

motorik (als Bewegung im Dienste der Ortsveränderung):

- Raum-Zeit-Ansprüche
- Stoffwechselansprüche
- Schutzansprüche
- Informationsansprüche
- Partneransprüche.

Diese Ansprüche sind vom physiologischen Zustand, der aktuellen Situation des Tieres sowie seinem Verhaltensmuster abhängig (Petrusewicz 1967, J. K. Müller 1984, G. Müller 1976, Kirchberg 1969, Vlijm & Richter 1966, Thomas & Sleeper 1977). Aktivitätsrelevant können der Ernährungszustand (J. K. Müller 1984, Grüm 1971a,b), die Fortpflanzungsreife (J. K. Müller 1984, Kirchberg 1969, Vlijm & Richter 1966, Granström 1973, Baars 1979/80), der Häutungs- (Dunger & Fiedler 1989) und der Gesundheitszustand des Tieres sein. So wurden vielfach Beziehungen zwischen endogener Rhythmik (besonders im Zusammenhang mit der Fortpflanzung) und der lokomotorischen Aktivität bei Carabiden beobachtet (Stein 1965, Mletzko 1972, J. K. Müller 1984, Ericson 1979, Baars 1979/80, Löser 1971). Von Wolfsspinnen ist bekannt, daß die Männchen in der Paarungszeit weit laufaktiver als die Weibchen sind (Vlijm & Richter 1966, Heydemann 1961b, Granström 1973). Ein Beispiel für die Verhaltensabhängigkeit der lokomotorischen Aktivität ist auch die erhöhte Neigung vieler Erigoniden-Weibchen zum Netzbau, die sich in deren geringerer Fangquote niederschlägt (Heydemann 1961b, De Keer & Maelfait 1988). Die Populationsdichte kann im Zusammenhang mit der Befriedigung der oben genannten Ansprüche aktivitätsfördernd oder -hemmend wirken (Grüm 1971a,b, Kaczmarek 1978, Fechter 1977). Andererseits wird die lokomotorische Aktivität über Migrationen unmittelbar zum Stellglied der Populationsdichteregulation.

Setzt man die oben genannten Ansprüche der Individuen zu ihrem Habitat in Relation, dann sind die Einflüsse von Nahrungs-, Requisiten- und Strukturangebot, Bodenfeuchte und -temperatur, Raumwiderstand und anderen dichteunabhängigen Faktoren auf die Aktivität verständlich. Feuchtigkeit und Temperatur bestimmen wesentlich den physiologischen Zustand der Tiere und nehmen so Einfluß auf deren lokomotorische Aktivität, können aber auch im Sinne des Aufsuchens optimaler mikroklimatischer Bedingungen zum Lokomotionsauslöser werden. Bekannt ist z.B. der negative Einfluß von niedrigen Temperaturen und Regen auf die Aktivität von Carabiden und Lycosiden (Ericson 1979, Honek 1988). Für die angestrebte synökologische Auswertung der Fallenfangergebnisse sind insbesondere Witterungseinflüsse störend und sollten durch ausreichend lange Fangperioden und die Berücksichtigung entsprechender Wetteraufzeichnungen in der Auswertung so weit als möglich eliminiert werden.

Der Raumwiderstand ist im Sinne von Heydemann (1956b) "der Umweltwiderstand, der der Aktivität der Tierwelt in den verschiedenen Schichten der Lebensräume hemmend entgegenwirkt und von der Struktur des gedachten Quer- oder Längsschnittes der geologischen und floristischen Aufbauelemente eines Biotops verursacht wird." (S. 332). Er ist schwer quantifizierbar und eine allgemeingültige Methode zu dessen Messung ist bisher noch nicht gefunden. Das Hauptproblem stellt allerdings die Tatsache dar, daß der Raumwiderstand wesentlich von Größe, Körperbau und Fortbewegungsweise der Tiere mitbestimmt wird und somit nicht summativ für ein Ökosystem oder auch nur einen Abschnitt der Bodenoberfläche angegeben werden kann. Möglichkeiten der Quantifizierung dieses Faktors sollen in einer separaten Arbeit diskutiert werden.

Das Verhältnis von Nahrungsangebot und -bedarf bestimmt bei Arten, die aktiv ihre Nahrung aufsuchen, wesentlich die lokomotorische Aktivität (J. K. Müller 1984, Uetz & Unzicker 1976, Grüm 1971a,b, Baars 1979/80, Vlijm & Richter 1966, Heydemann 1961b, Honek 1988). Andererseits induziert diese unmittelbar Energie- und damit Nahrungsbedarf (Tembrock 1982, Heydemann 1961b). Nahrungsbedarf und lokomotorische Aktivität korrelieren bei vielen Tieren positiv (J. K. Müller 1984, Grüm 1971a, Vlijm & Richter 1966), denn mit zunehmender Lokomotionsgeschwindigkeit und zurückgelegtem Weg nimmt deren Energiebedarf zu. Dadurch ist die Aktivitätsdichte lokomotorisch aktiver Semaphoronten besser als die Abundanz geeignet, deren produktionsökologische Bedeutung im Ökosystem einzuschätzen (Schwerdtfeger 1975, J. K. Müller 1984, Obrtel 1971, Růžička 1987, Heydemann 1961b, Schaefer 1972).

Die Aktivitätsdichten stark in ihrer Körpergröße differierender Tiere sind nicht vergleichbar, denn sie entsprechen einem völlig unterschiedlichen Energie-Turnover. Um dennoch zu synökologischen Aussagen zu gelangen, bildet man Größenklassen (Schwerdtfeger 1975, Tischler 1955, Růžička 1982-84,

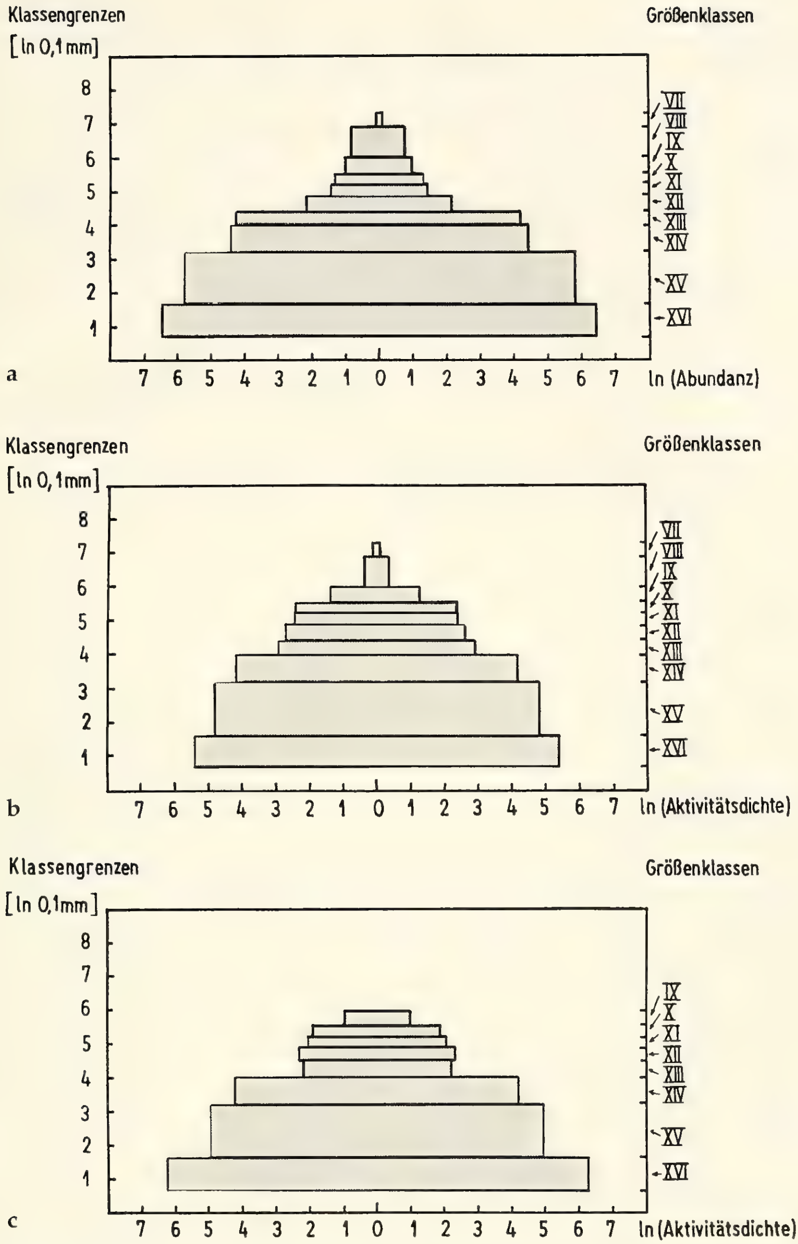

Abb. 2. Größenklassenpyramiden der oberflächennahen Bodenfauna bzw. des Epigaions im FND "Rutsch" (Größenklassifikation nach Kuschka et al. 1987). **a.** Abundanzverteilung entsprechend den Ergebnissen von Bodenproben (Ind./m^2). **b.** Aktivitätsdichteverteilung entsprechend glycerolgefüllten Glasfallen (Ind./d · m). **c.** Aktivitätsdichteverteilung entsprechend glycerolbestückten Fraktionsfallen (Ind./d · m).

Kuschka et al. 1987). Der Vergleich der Größenklassenpyramiden des Fallenfanges und der Abundanz der Bodenfauna eines Gebietes zeigt, daß mit zunehmender Körpergröße die Aktivitätsdichte in wachsendem Maße von der lokomotorischen Aktivität der Tiere geprägt ist. Diese gleicht die mit steigender Körpergröße abnehmende Abundanz teilweise aus (Abb. 2).

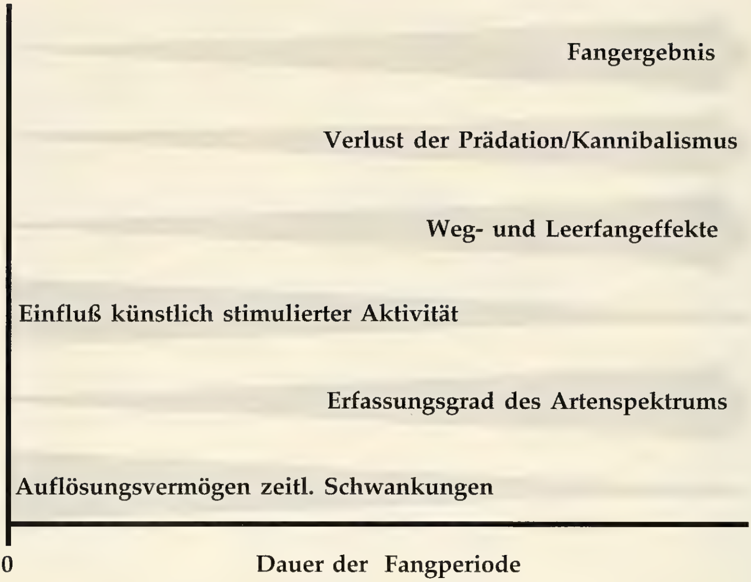

Abb. 3. Vereinfachtes Schema der Abhängigkeit von Einflußfaktoren und Eigenschaften der Fangergebnisse von der Dauer der Fangperiode.

Die Abundanz (Populationsdichte) korreliert mit der Biomasse der Population und repräsentiert so gewissermaßen die stoffliche Seite. Entsprechend wurde von verschiedenen Autoren versucht, die Abundanz indirekt aus Fallenfangergebnissen zu ermitteln (Skuhravý 1956b, J. K. Müller 1984, Baars 1979, Grüm 1971b, Dunger & Fiedler 1989, Kuschka et al. 1987). Dabei wurde die Korrelation der Aktivitätsdichte mit der Abundanz nachgewiesen und mathematisch modelliert (Braune 1974, Baars 1979, J. K. Müller 1984, Adis 1979, Ericson 1979, G. Müller 1976, Heydemann 1961b, Fechter 1977). Viele der aus den mathematischen Modellen abgeleiteten Methoden der Abundanzberechnung (vgl. Kap. 5.3.) setzen neben der Aktivitätsdichte die Messung der lokomotorischen Aktivität (als Aktionsradius/Zeit) voraus. Entsprechende Meßmethoden sind in Kap. 5.2. ausführlich diskutiert.

Die Aktivitätsdichte- und Abundanzwerte (im Sinne von Individuendichte) der Semaphorontengruppen fließen im Idealfall, gemeinsam mit den Ergebnissen weiterer Untersuchungsmethoden, in die Inventarisierung der entsprechenden Straten der Biozönose ein. Ein Vergleich des Epigaions verschiedener Ökosysteme ist aber auch schon auf der Basis von Bodenfallenfängen allein möglich. Mit der Berechnung des relativen Anteils der Arten an der Gesamtaktivitätsdichte bzw. Gesamtabundanz (als Aktivitätsdominanz bzw. Dominanz) läßt sich die Bedeutung dieser im Stoff- und Energiewechselgefüge des Ökosystems abschätzen. Dabei müssen unterschiedliche Typen der Konsumtionsweise und, innerhalb dieser, Größenklassen als Vergleichskategorien getrennt betrachtet werden.

Sowohl Abundanz als auch Aktivitätsdichte unterliegen periodischen und aperiodischen Schwankungen, die als aspektbedingte Jahresperiodik und langfristige Sukzessionsprozesse Gegenstand synökologischer Forschung sind. In diesem Zusammenhang verdient der Zeitfaktor des Bodenfallenfanges Beachtung. Grundsätzlich steigt mit zunehmender Anzahl Fangperioden und abnehmender Fangzeit/Periode das "Auflösungsvermögen" hinsichtlich zeitlicher Aktivitätsdichteschwankungen (Abb. 3). Mit abnehmender Fangzeit/Periode ist aber auch eine Zunahme der statistischen Unsicherheit der Ergebnisse durch abnehmende Fangquoten verbunden. Diese ist durch Erhöhung der Fallenzahl auszugleichen (Bombosch 1962).

Die Einhaltung optimaler Fangzeiten, verbunden mit optimalen Fallenzahlen und -dichten hat wesentlichen Einfluß auf die Aussagefähigkeit der Ergebnisse (s. Kap. 5). Um die dominanten Artenkombinationen verschiedener Biogeozönosen vergleichen zu können, sind Untersuchungszeiträume von mindestens einer Vegetationsperiode notwendig. Im Rahmen des damit verfügbaren Datenmaterials bietet es sich an, zusätzlich die dominante Artenkombination auch zeitlich entsprechend der

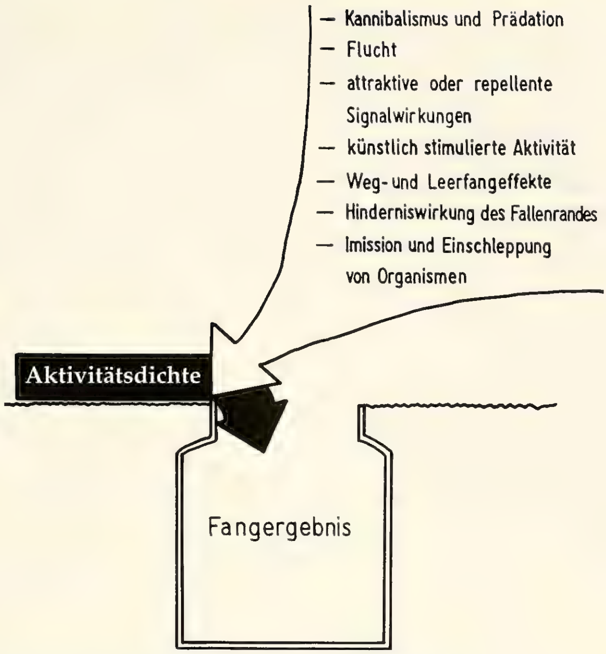

Abb. 4. Fehler bei der Messung der Aktivitätsdichte mittels Bodenfallen.

Aspekte zu differenzieren. Dabei sei die quantitativ-strukturelle Seite betont, indem die Aspekte als Aktivitätsdichtemaxima aufgefaßt werden.

Mit Hilfe eines Computermodells wurde geprüft, inwieweit Bodenfallenergebnisse das räumliche Verteilungsmuster der Individuen widerspiegeln. Es zeigte sich, daß sowohl Zufallsbewegung als auch gerichtete Bewegung des Tieres in variabler Richtung innerhalb kürzester Zeit jedes anfängliche Verteilungsmuster in eine Zufallsverteilung wandeln. Lediglich der ausgesprochen unwahrscheinliche Fall, daß alle Tiere gleichmäßig verteilt sind und sich parallel zueinander bewegen, würde wieder zu einer gleichmäßigen Verteilung führen. Es ist außerdem zu beachten, daß mit dem Fallenfang der Weg des Tieres an zufälliger Stelle abgeschnitten wird, die bis zur Falle zurückgelegte Wegstrecke also auch dem Zufall unterliegt. Damit können die Fangzahlen der Fallen weder das Verteilungsmuster der Individuen einer Population zu einem bestimmten Zeitpunkt, noch deren mittleres Verteilungsmuster im Fangzeitraum widerspiegeln. Die Berechnung von Dispersionsparametern aus Fallenfangergebnissen ist folglich inhaltslos.

4 Fehlerquellen bei der Messung der Aktivitätsdichte

Das voranstehende Kapitel behandelte die Aktivitätsdichte als objektive Größe, aus der sich entsprechende Aussagen ableiten lassen. Einige Autoren (Balogh 1958, Obrtel 1971, Tretzel 1955, Skuhravý 1964, Heydemann 1956a, b) setzen die Aktivitätsdichte dem Fangergebnis bzw. dessen mathematischer Bearbeitung gleich. Das Verhältnis von Aktivitätsdichte und Fangergebnis ist indes ein anderes: Die Bodenfalle ist, wie bereits erwähnt, als Meßinstrument der Aktivitätsdichte aufzufassen, das Fangergebnis also damit das Meßergebnis. Da jedes Meßinstrument mit einem mehr oder weniger großen Meßfehler behaftet ist, ist es in keinem Fall in der Lage, die Meßgröße vollkommen objektiv und richtig zu erfassen. Darin liegt der eigentlich neuralgische Punkt des Bodenfallenfanges. Wenn die praktische Aussagefähigkeit von Bodenfallenergebnissen beurteilt werden soll, dann ist das in erster Linie eine Frage des Einflusses dieser Meßfehler.

Die wesentlichsten Meßfehler der Aktivitätsdichtemessung mittels Bodenfallen sind in Abb. 4 schematisch dargestellt. Die Reihenfolge soll keine Rangfolge darstellen. Besonders bei Lebendfallen

(ohne Konservierungsflüssigkeit) spielen Kannibalismus und Prädation in der Falle eine große Rolle (Breymeyer 1966, Dunger 1963, Roth 1984/85, Heydemann 1961b). Der Umfang dieser Fangverluste hängt wesentlich von Menge und Zusammensetzung des Fanges, der Dauer dessen Verbleibs in der Falle und einer Reihe weiterer Randbedingungen ab. In erster Linie weichhäutige Tiere (besonders Spinnen) und Carabiden sind von diesen betroffen. Die Verluste an Carabiden lassen sich relativ genau bestimmen, da zumeist Teile des Chitinpanzers übrigbleiben, die mit einiger Erfahrung den Arten zugeordnet werden können (Tab. 1). Carabiden wurden meist erst nach mehreren Tagen Verbleib des Fanges in der Falle gefressen. Vielleicht sind nur bereits verendete Tiere betroffen. Auch eine Bestimmung der Verluste an Spinnen-Männchen, die im Fallenfang dominieren, ist recht genau möglich, da meist zumindest ein Taster erhalten bleibt, der die Determination ermöglicht. An Hand der durchschnittlichen Aktivitäts-Sexualindizes der betroffenen Arten läßt sich auf die Gesamtverluste hochrechnen (Tab. 1).

Weniger genau sind die Verluste weichhäutiger Tiere zu bestimmen, die Carabiden als Nahrung dienen könnten. Deshalb wurde, ausgehend von 56 Fallenergebnissen, der Zusammenhang zwischen den Fangquoten der Carabiden und weichhäutiger Kleintiere, besonders Collembolen, geprüft. Es ließ sich keine signifikante Korrelation nachweisen. Derartige Prädationsverluste haben also wahrscheinlich keinen wesentlichen Einfluß auf das Fangergebnis.

Auch Spinnen, die in der Fallenöffnung ihre Netze bauen, führen zu Prädationsverlusten (Heydemann 1961b). Vergleiche der Collembolenfänge in Fallen mit und ohne derartige Fangnetze in den Monaten Juni bis Oktober 1988 (FND "Rutsch") erbrachten zwar, mit Ausnahme des Monats Oktober, höhere durchschnittliche Fangmengen in den Fallen ohne Netz, die Unterschiede waren aber in keinem Fall signifikant. Ebenso sah das Ergebnis eines derartigen Vergleichs zwischen Fangergebnissen vom April 1989 aus.

Je nach Fallentyp und Tierart spielen Verluste durch Flucht aus der Falle eine mehr oder weniger große Rolle (Balogh 1958, Skuhravý 1964, Braune 1974, Baars 1979, G. Müller 1976, Kirchberg 1969, Luff 1975, Fechter 1977, Růžička 1982, Adis 1976, Seifert 1990). Die Verluste bei Lebendfallen sind zwar wesentlich größer als bei Fallen mit Fangflüssigkeit (Balogh 1958, Braune 1974), aber auch letztere sind nicht verlustfrei (Skuhravý 1964, Thiele 1977, Petruska 1969, Seifert 1990). Bei kriechenden Arten (besonders Annelida, Gastropoda) (Dunger 1963, Müller-Motzfeld & Hartmann 1985), guten Fliegern (besonders Diptera, Hymenoptera) (Tschirnhaus 1981, Heydemann 1956a) und Springern (besonders Orthoptera) (Müller-Motzfeld & Hartmann 1985) ist die Entkommensrate so hoch, daß praktisch keine Messung der Aktivitätsdichte mittels Bodenfallen möglich ist. Ähnliches kann auf gute Kletterer unter den Läufertypen zutreffen (z.B. Spinnen, die an ihrem Faden emporklettern, Kanker, Ameisen) (Braune 1974, Baars 1979, G. Müller 1976, Adis 1979, Seifert 1990, Dunger & Fiedler 1989). Fallaub o.ä. kann die Entkommensrate bis zur Unbrauchbarkeit der Falle steigern (Knopf 1962).

Die Verlustquote durch Kannibalismus/Prädation und Entkommen aus der Falle wurde durch Intervallfang im August 1988 untersucht (Abb. 5). Die 21 im FND "Rutsch" aufgestellten, Lebendfallen wurden in der Zeit vom 14. bis 21.8. aller 2 Tage kontrolliert. Der Fang wurde jeweils registriert und in den Fallen belassen. Er umfaßte insgesamt 53 Tiere (0.027 pro Fangstunde). Davon gingen 21 (0.012 pro Fangstunde), also 39.62 % verlustig. Ein Vergleich der Ergebnisse einer in Intervalleerung betriebenen mit einer durchlaufenden Falle zeigt, daß besonders bei Carabiden die Verluste (hier vor allem durch Kannibalismus) wesentlichen Einfluß auf die gemessene Aktivitätsdichte haben können (Tab. 1).

Tab. 1. Verluste des Fallenfanges während der Intervalluntersuchungen 1988 im FND "Rutsch" im Vergleich zu einer durchlaufenden Falle.* exclusive Acari. Alle Angaben in Fang/Fangstunde.

	Intervallfalle	durchlaufende Falle
Gesamtfang Carabidae	0,028	0,017
abzügl. Verluste	0,018	
Gesamtfang Arachnoidea*	0,003	0,003
abzügl. Verluste	0,001	
Gesamtfang Sonstige	0,003	0,003
abzügl. Verluste	0,001	
Summe Gesamtfang	0,034	0,023
abzügl. Verluste	0,020	

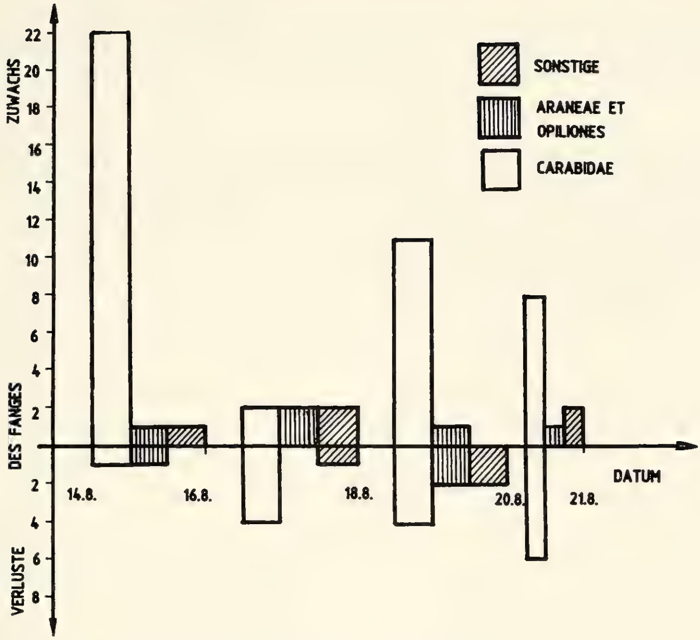

Abb. 5. Ergebnisse des Intervallfanges im FND "Rutsch", August 1988.

Diese Verluste spiegeln sich auch im Größenklassenspektrum des Fallenfanges wider (Abb. 2). Das Fehlen der Größenklassen VIII und VII im Fang der Fraktionsfallen gegenüber den gleichzeitig aufgestellten Glasfallen ist vorwiegend der Flucht von Nacktschnecken und z.T. Kleinsäugern zuzurechnen (vgl. Kap. 5.1.).

Fallen können als Fremdkörper in der natürlichen Umwelt generell Verhaltensänderungen von Tieren hervorrufen, die entweder zu einer künstlich erhöhten (Attraktion) oder verringerten (Repellenz) Fangquote führen. Von der Falle ausgehende, chemische, physikalische und komplex-strukturbedingte Signale lösen diese Verhaltensänderungen aus. Stärke, Wirkungsraum und Bewertung (attraktiv, repellent, neutral) dieser Signale werden von einem Komplex semaphorontenabhängiger (Art, Alter, Geschlecht, Entwicklungsstadium, physiologischer Status usw.) und semaphorontenunabhängiger Faktoren (Witterung, Raumstruktur des Ökosystems, Nahrungs- und Strukturangebot usw.) bestimmt. Dadurch ist deren Einfluß auf die gemessene Aktivitätsdichte prinzipiell unberechenbar. Beköderte Fallen, die die attraktive Wirkung des Köders auf bestimmte Tiere ausnutzen, sind für synökologische Fragestellungen unbrauchbar und für autökologische Aufgaben zumindest fragwürdig.

Von zahlreichen Autoren wird die chemische Signalwirkung der Fangflüssigkeit diskutiert (Tab. 2). Für die meisten untersuchten Stoffe konnte diese wahrscheinlich gemacht werden. Auf der Suche nach einer Alternative erprobte der Autor deshalb ein Glycerol-Wasser-Gemisch (2:1). Glycerol ist geruchsneutral, kann aber bei längerem Einsatz Geruch durch den Fang annehmen. Dieses Gemisch bietet den Vorteil, ungiftig und preiswert sowie kaum von Verdunstungsverlusten betroffen zu sein. Ein Vergleich der Fangergebnisse von Fraktionsfallen (siehe Kap. 5) mit Glycerol, lebend-fangenden Glasfallen und solchen mit Formalin ermöglicht Rückschlüsse auf mögliche Signalwirkungen des Glycerol-Wasser-Gemisches (Tab. 3) (Einsatz August/September 1985 im NSG "Gülper See"). Sieht man von den überlagernden Wirkungen von Kannibalismus/Prädation und der Attraktion durch Formalin (besonders Carabidae) ab, ist lediglich bei den Myriapoda eine attraktive Wirkung des Glycerols nicht auszuschließen.

Neben der Fangflüssigkeit kann auch der Fang selbst Ausgangspunkt chemischer Signale sein. Bekannt ist vor allem die attraktive Wirkung verwesender Tiere (besonders von Kleinsäugern) auf aasfressende Arten (Müller-Motzfeld & Hartmann 1985, Renner 1981/82, Tschirnhaus 1981, Dunger 1963, Geiler & Bellmann 1974), die sich auch in Tabelle 3 bei den Catopidae und Silphidae widerspie-

gelt. Über die Wirkungen der Pheromone, die viele Insektenarten im Dienste der Partnersuche, der Aggregation von Individuen oder auch der Warnung vor Gefahren abgeben, auf das Fallenergebnis ist noch wenig bekannt (Adis 1976, Thomas & Sleeper 1977, Seifert 1990). Neben auf chemischer Signal-

Tab. 2. Auswertung der Literatur zur chemischen Signalwirkung unterschiedlicher Fangflüssigkeiten. Diese Übersicht entstand unter Verwendung folgender Quellen: 1. Skuhravý 1964; 2. Geiler 1954/55; 3. Skuhravý 1970; 4. Heydemann 1956a; 5. Adis 1979; 6. Adis & Kramer 1975/76; 7. Braune 1974; 8. Renner 1981/82; 9. Dunger 1963; 10. Ericson 1979; 11. G. Müller 1976; 12. Gottschalk 1958; 13. Greenslade & Greenslade 1971; 14. Adis 1976; 15. Seifert 1990; 16. Bährmann 1976; 17. Geiler & Bellmann 1974; 18. Ohnesorge 1953 (zitiert nach Renner 1981/82). In der Spalte "Fangflüssigkeit" wurde an erster Stelle der Name laut chemischer Nomenklatur und in Klammern der gebräuchliche Trivialname vermerkt. Erklärung der Abkürzungen: I: indifferent; A: attraktiv; R: repellent.

Fangflüssigkeit	Wirkung	betroffene Sippen	Quellen
Ethandiol	A	Brachycera	2
(Ethylenglykol,	R	Spinnen	17
Glykol)	A	Nacktschnecken	4; 5; 9; 11
	I	Insekten	11
niedere Aldehyde	A	Fichtenrüßler	18
Methanal-Lösung (Formaldehyd)	A	Carabidae	1; 3; 5; 6; 7
	A	Lathridiidae	8
	A	*Pterostichus cupreus*	10
	A	Diptera, Coleoptera	11
	R	Gastropoda, Bibionidae, Elateridae	14
	A	sonst. Coleoptera, Lithobiidae, Araneae	14
	R	*Formica rubra*	15
Pentanal	A	*Carabus problematicus*	6
Heptanal	A	*Carabus problematicus*	6
Methanol-Lösung	A	*Leptocera* spec.	16
Methanol	I	Ameisen	5
Ethanol	A	Coleoptera	8
	A	Diptera	8
Brennspiritus	A	*Cryptophagus dentatus*	8
	A	Lathridiidae	8
	A	Histeridae, Scolytidae, Cuculionidae	13
Ethanol/Propantriol-(Glycerol-) Gemisch	A	Hypogastrura (Collembola)	13
	A	Fomicidae	13
Ethanol-Ethansäure-	A	*Aleochara* spec.	8
Wasser-Gemisch	A	Diptera	8
	A	Catopiden, Silphiden	8
Ethansäure	A	*Aleochara* spec.	8
(Essigsäure)	A	Diptera	8
Oktanol	A	blütenbesuchende Staphylinidae	12
2, 4, 6-Trinitrophenol (Pikrinsäure)	I	*Carabus problematicus*	5; 6
	A	Bibioniden, Gastropoda, Elateriden	14
	I	Myriapoda, Arachnida, sonst. Coleoptera	14
	A	kleine Arachnida	14
Kaliumbichromat-Lösung	I-A	Kleinarthropoden	9
Trinatriumorthophosphat-Lösung	I-A	Kleinarthropoden	9
Wasser	A	Kleinarthropoden	8
	I	Kleinarthropoden	4; 11
	A	*Pt. oblongopunctatus*	14

wirkung beruhenden Ködereffekten gefangener Tiere sind optische Lockwirkungen dieser nicht auszuschließen (Braune 1974).

Sowohl die Fallen selbst (als "Mikrohöhlen") als auch die Fallendächer können kleinräumig das Klima verändern oder anderweitig physikalische Signalwirkung haben. Verschiedene Autoren weisen vor allem hin auf:

- den Schatteneffekt, verbunden mit Erhöhung der Luftfeuchte und Senkung der Temperatur, durch das Dach (Dunger & Fiedler 1989, Růžička 1982, Bombosch 1962, Heydemann 1956a, G. Müller 1976, Joosse 1965, Dunger 1963, Baars 1979, Adis 1979, Geiler 1963, Thomas & Sleeper 1977)
- die mögliche Brennglaswirkung von durchsichtigen Dächern (G. Müller 1976, Dunger & Fiedler 1989)
- die optische Signalwirkung farbiger Fallendächer (Baars 1979) und von farbigen Fangflüssigkeiten, wie Pikrinsäure (Adis 1976)
- mögliche Austrocknungseffekte durch Niederschlagsabschirmung des Fallendaches (Dunger 1963)

Der Einfluß lackierter Pappdächer auf das Mikroklima wurde im August 1988 im FND "Rutsch" untersucht. Einer durchschnittlichen relativen Luftfeuchte von 62.20 % im Untersuchungsgebiet stehen 74.23 % in der Falle gegenüber. Die durchschnittliche Augenblickstemperatur von 20.31 °C im Gebiet wurde mit 19.79 °C in der Falle unterschritten. Der t-Test weist eine mit 99 % Sicherheit signifikant höhere Durchschnittsluftfeuchte in der Falle aus. Beachtet man jedoch, bei Anwendung des F-Tests, die größere Streuung der Luftfeuchte im Untersuchungsgebiet, ist der Unterschied nicht signifikant. Die Temperaturdifferenzen sind nicht signifikant. Durch die Falle bzw. Fallendächer entstehen also Luftfeuchteverhältnisse, die dem oberen Bereich natürlicher Schwankungen entsprechen und Temperaturverhältnisse entsprechend dem unteren Bereich dieser. Die Signalwirkung ist damit nicht größer, als sie auch von den natürlichen mikroklimatischen Bedingungen ausgeht.

Zu den physikalischen Signalen zählen auch Veränderungen der Boden- und Raumstruktur im unmittelbaren Umfeld der Falle, sei es durch Niedertrampeln der Vegetation bei Entnahme der Falle oder die, von einigen Autoren vorgeschlagene, bewußte Veränderung der Bodenoberfläche (Braune 1974, Renner 1981/82, Flatz 1986, Baars 1979). Es ist empfehlenswert, diese durch eine entsprechende Methodik (siehe Kap. 5) möglichst gering zu halten (Flatz 1986).

Schließlich wirkt die Hohlraumstruktur der Falle auch als Signal. Vor allem verschiedene Spinnenarten nutzen diese zum Bau ihrer Netze (Heydemann 1961b, G. Müller 1976) (Tab. 4). Auf die möglichen Prädationseffekte dieser Spinnen wurde bereits hingewiesen. Auch Käfer und andere Tiere nutzen teilweise besonders Lebendfallen als Refugium (Adis 1979, Dunger 1963, Dunger & Fiedler 1989, Geiler & Bellmann 1974), entwickeln also eine gerichtete und damit erhöhte lokomotorische Aktivität in Richtung der Falle.

Tab. 3. Vergleich der Ergebnisse der Lebendfallen, Formalinfallen und Fraktionsfallen (mit Glycerol), die parallel im NSG "Gülper See" zum Einsatz kamen. Alle Angaben in Fang/Fangstunde:

Taxon	Lebendfallen	Formalinfallen	Fraktionsfallen
Carabidae	0,0045	0,0618	0,0105
Staphylinidae	0,0297	0,1320	0,0731
Catopidae	0,0077	0,0108	0,0005
Silphidae	0,0021	0,0005	0
sonstige Coleopt.	0,0088	0,0466	0,0174
Linyphiidae et Erigonidae	0,0031	0,067	0,0059
Phalangiidae	0,0007	0,0044	0
Tetragnathidae	0	0,0020	0
Lycosidae	0	0,0029	0,0009
Acari	0,0360	0,0942	0,0265
Collembola	0,0088	0,1697	0,1083
Myriapoda	0,0011	0,0039	0,0078
Diptera	0,0266	0,0868	0,0251
Hymenoptera	0,0011	0,0206	0,0224
Sonstige	0,0081	0,0711	0,0064

Selbst exakteste Arbeitsweise des Untersuchenden kann nicht verhindern, daß der Fallenrand einen krassen Medienwechsel für die epigäisch aktiven Tiere darstellt. Dieser ist einerseits durch das Porensystem des Bodens selbst, das keinen völlig nahtlosen Übergang zur Falle zuläßt, und andererseits durch die Dicke des Fallenrandes (meist einige mm!) bedingt. Für einige Tiere stellt dieser Medienwechsel ein Hindernis dar, daß sie zum Umkehren am Fallenrand veranlaßt und damit deren Unterrepräsentanz im Fang bedingt (Braune 1974, Adis 1979, Heydemann 1961 b, Seifert 1990, Renner 1981/82). Durch die unvermeidbaren Poren zwischen Bodenpartikeln und Fallenrand ist das Größenklassenspektrum der mit Bodenfallen quantitativ erfaßbaren Tiere nach unten begrenzt (Adis 1979, Skuhravý 1964, Loreau 1984) (Abb. 2).

Adis (1979), Joosse (1965), Joosse & Kapteijn (1968), Greenslade (1973) und Franke et al. (1988) weisen darauf hin, daß Begängnis des Untersuchungsgebietes durch den Experimentator und andere Personen sowie die Aktivitäten beim Eingraben und Entnehmen der Falle ("digging-in effect") die lokomotorische Aktivität bestimmter Tiere (Formicoidea, Collembola, Araneae) künstlich erhöhen. Um den Einfluß dieser Effekte zu testen, wurden die Fangquoten von Collembolen aus 17 Bodenfallen (FND "Rutsch") der Monate Juli und August 1988 verglichen. Erfolgten im Juli drei Kontrollen während der Fangperiode, so wurden im Zuge der Intervalluntersuchung im August die Fallen sechsmal kontrolliert. Im Ergebnis stehen 4168 Fängen im Juli, 2812 im August gegenüber. Das entspricht einer Aktivitätsdichte von 132.45 $d^{-1} \cdot m^{-1}$ im Juli und 87.85 $d^{-1} \cdot m^{-1}$ im August. Stellt man den Einfluß der Feuchtigkeit auf die lokomotorische Aktivität der Collembolen entsprechend den Angaben von Bauer (1979) in Rechnung (lineare Korrelation vorausgesetzt), ergeben sich für den August entsprechend der Witterung korrigierte Aktivitätsdichtewerte zwischen 117.90 und 164.35 $d^{-1} \cdot m^{-1}$. Die künstliche Erhöhung der lokomotorischen Aktivität durch die zusätzlichen Kontrollen im August kann hier also keinen signifikanten Einfluß auf die gemessene Aktivitätsdichte haben. Im übrigen könnte die, von Joosse (1965) einige Tage nach dem Eingraben der Fallen beobachtete, erhöhte Aktivität der Collembolen auch als Leerfangeffekt interpretiert werden. Die nach einer längeren Fangzeit gemessene Aktivitätsdichte wäre dann als künstlich verringert anzusehen. Schließlich ist zu beachten, daß Störungen, durch große Tiere z.B., zur natürlichen Umwelt der epigäischen Fauna gehören, womit die entsprechende Aktivität als normal anzusehen wäre.

Bodenfallen beeinflussen durch Entzug der gefangenen Individuen selbst die Abundanz (Fechter 1977, Ericson 1979, G. Müller 1976, Luff 1975, Stein 1965, Renner 1981/82, Braune 1974, Baars 1979, J. K. Müller 1984, Franke et al. 1988). Dieser "Leerfangeffekt" ist im gesamten Einzugsbereich der Falle, der durch den Aktionsradius der Art bestimmt wird, wirksam (G. Müller 1976, Renner 1981/82, Baars 1979, Franke et al. 1988). So wie mit zunehmender Entfernung von der Falle die Fangwahrscheinlichkeit abnimmt, nimmt auch der Einfluß dieses Effektes ab (Abb. 6). Entsprechend der Fangwahrscheinlichkeit (Kuschka et al. 1987) ist mit einer Abundanzabnahme von ≥10 % im Umkreis von ca. 3.25 Fallenradien und einer solchen von ≥1 % im Umkreis von 31.84 Fallenradien zu rechnen. Die höchste

Tab. 4. Spinnenarten, die ihre Netze in die Öffnungen von Bodenfallen bauen (Beobachtungen aus dem FND "Rutsch" 1988/89). Unsicher bestimmte Arten sind in Klammern gesetzt, Zahlenangaben in Klammern kennzeichnen jeweils subadulte Tiere.

Art	Beobachtungen von Netzen mit		
	Männchen	Weibchen	Inadulte
Pachygnatha clercki	–	–	1
Araneus (cornutus)	–	–	1
Ceratinella brevis	–	1	–
Lepthyphantes flavipes	4	15	–
Lepthyphantes tenebricola	5	20	–
Lepthyphantes tenuis	–	2	–
Lepthyphantes pallidus	–	1	–
Bathyphantes nigrinus	1	1	–
Bathyphantes gracilis	1	1	–
Linyphia clathrata	–	(1)	–
Linyphia (hortensis)	(3)	–	–
Linyphiidae	–	–	9

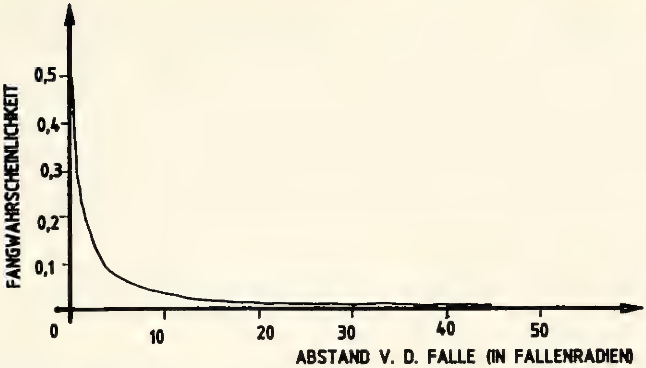

Abb. 6. Einfluß des Leerfangeffektes auf die Abundanz entsprechend der Fangwahrscheinlichkeit in Abhängigkeit vom Fallenabstand der Tiere.

Fangwahrscheinlichkeit wird mit 0.5 am Fallenrand erreicht. Ein Leerfang tritt also natürlicherweise nicht ein, denn es werden zu einem gegebenen Zeitpunkt maximal 50 % der Individuen eines Kreisbogens um die Falle gefangen. Leerfang kann nur dann erreicht werden, wenn die Zuwanderung von Individuen künstlich verhindert wird. Im Normalfall gleicht diese die eingetretene Abundanz- bzw. Aktivitätsdichteabsenkung im fallennahen Bereich früher oder später aus.

Der bei den Fallen im FND "Rutsch" gegebene Kontrollrhythmus (6 Tage + 1 Tag) läßt Rückschlüsse auf den Einfluß des "Leerfangeffektes" bei Carabiden und Großspinnen zu. Dieser Effekt müßte sich in niedrigerer Fangquote der Tiere im 1-Tag-Intervall gegenüber dem vorhergehenden 6-Tage-Intervall äußern, da in letzterem bereits ein Teil des Einzugsbereiches der Fallen leergefangen wird. Die Gesamt-Fangquote der Carabiden im 6-Tage-Intervall von 0.608 / Fangstunde steht der von 0.249 / Fangstunde des anschließenden eintägigen Fanges gegenüber. Der Mittelwert der 6-Tage-Fänge von Carabiden ist mit 99 % Sicherheit (t-Test) signifikant größer als der von 1-Tages-Fängen. Anders liegen die Ergebnisse bei den Großspinnen (6-Tage-Perioden: 0.037 / Fangstunde; 1-Tages-Fänge: 0.115 / Fangstunde). Das größere Ergebnis der 1-Tages-Periode ist sicher durch geringere Prädationsverluste zu erklären, die den eventuell gegebenen "Leerfangeffekt" überdecken.

Ist für ein Individuum gleichzeitig die Fangwahrscheinlichkeit für mehrere Fallen >0, befindet es sich also in der Überschneidung der Einzugsbereiche mehrerer Fallen, dann tritt ein gegenseitiger "Wegfangeffekt" dieser Fallen ein. Die in beiden Fallen gemessenen Aktivitätsdichtewerte sind dann künstlich verringert (Dunger & Fiedler 1989, Fechter 1977, Luff 1975, Stein 1965, Braune 1974, J. K. Müller 1984). Je geringer der Abstand dieser Fallen ist, desto größer ist der Überschneidungsbereich. Zu beachten ist auch hier, daß mit zunehmender Fangdauer der Einzugsbereich der Falle wächst. Bei annähernd homogener Populationsdichteverteilung ist der Anteil der Individuen, die sich im Einzugsbereich zweier Fallen befinden an der Gesamtindividuenzahl in beiden Fangbereichen der Fallen gleich dem Anteil der Überschneidungsfläche dieser Fallen an der Gesamtfläche der Fangbereiche. Rechnet man die Fangwahrscheinlichkeit der Individuen im Überschneidungsbereich, als Funktion des Abstandes von der Falle (Kuschka et al. 1987), mit ein, dann läßt sich der Einfluß des Wegfangeffektes auf den Fang in Abhängigkeit vom Abstand der beiden Fallen berechnen (Abb. 7). Im Falle der Deckungsgleichheit der beiden Fallen ist dieser Faktor =1, bei einer Entfernung um den doppelten Aktionsradius der Art =0.

Nicht alle in der Falle vorgefundenen Tiere müssen durch eigene Aktivität in diese gelangt sein. Wind und Niederschläge führen zur Immission von Organismen (Dunger & Engelmann 1978, Dunger & Fiedler 1989). Aus oberen Straten des Ökosystems fallen mitunter Tiere auf den Boden und damit in die Falle, die sich hier natürlicherweise kaum bewegen (z.B. Spannerraupen) (Geiler & Bellmann 1974). Diese Immissionen lassen sich durch entsprechende Arbeitsweise und Hilfsmittel (Fallendächer, Immissionsschutz) minimieren und erlangen so selten wesentliche Bedeutung.

Beim Aufstellen und Leeren der Fallen läßt sich mitunter der Eintrag von Bodenpartikeln, Laub etc., mit denen Tiere verfrachtet werden können, nicht ganz vermeiden. Namentlich Ektoparasiten (z.B. Käfermilben, Flöhe) gelangen vorwiegend durch den Fang ihrer Wirte in die Falle, nicht aber

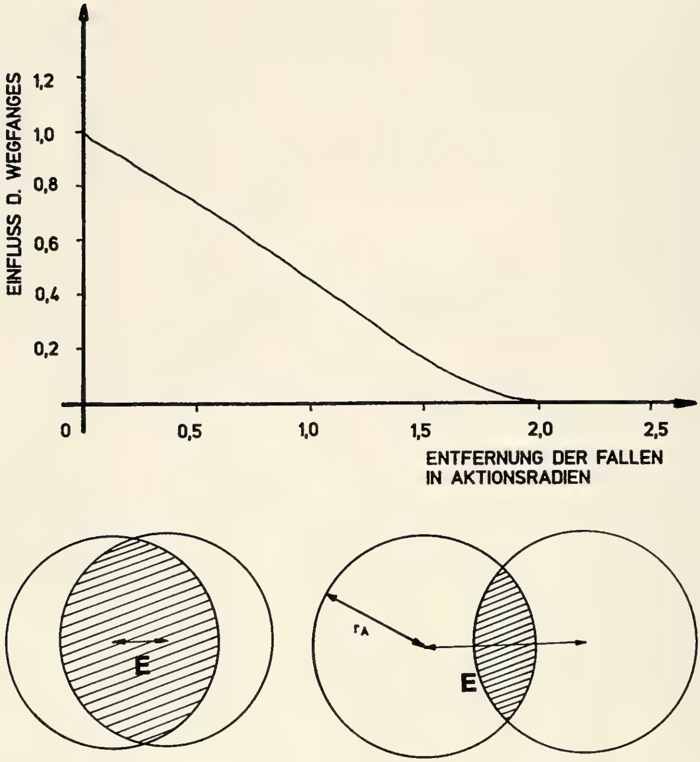

Abb. 7. Einfluß des Abstandes zweier Fallen (gemessen als Faktor eines konstanten Aktionsradius r_A = 3,7 m) auf den Anteil der Tiere in ihrem Einzugsbereich, die vom Wegfangeffekt betroffen sind (Fallenradius r_F = 3,7 cm).

durch eigene lokomotorische Aktivität. Allerdings können diese "Beifänge" wertvolle Hinweise auf den Parasitierungsgrad bestimmter Wirtspopulationen liefern. Mitunter gelangt durch den Fang von Prädatoren deren Beute passiv in die Falle, wie das Seifert (1990) bei Ameisen beobachtete. Ameisen benutzen auch die Bodenfallen gelegentlich als Abfallgrube für getötete Nestgenossen oder Feinde (Seifert 1990).

5 Optimierung der Fang- und Auswertungsmethodik

5.1 Fangtechnik

Um die Potenzen des Bodenfallenfanges voll zu erschließen, müssen zunächst die voranstehend besprochenen Meßfehler minimiert werden. Möglichkeiten dafür ergeben sich bereits bei der Festlegung von Fallenzahl und -verteilung im Untersuchungsgebiet. Eine Überschneidung der Einzugsbereiche der Fallen ist zu vermeiden, um Wegfangeffekte zu verhindern. Die Fallen müssen mindestens um den doppelten Aktionsradius der lokomotorisch aktivsten Arten voneinander entfernt sein (J. K. Müller 1984, Thomas & Sleeper 1977). Dieser kann für konkrete Fangperioden als r_E berechnet werden:

$$1.\ r_E = \frac{t \cdot r_{Arw}}{12} \cdot \frac{t}{(-0.00071\ t + 1,24) \cdot \sqrt[3]{t^2}}$$

r_E: Mindestabstand der Fallen, r_{Arw}: Aktionsradius des "random walk" der laufaktivsten Art, t: vorgesehene Fangzeit in Tagen.

Da Aktionsradiusmessungen erstmals im Anschluß an die erste Fangperiode möglich sind, besteht zunächst ein erhöhtes Risiko zu geringer Abstände. Dieses läßt sich durch die Einhaltung eines Mindestabstandes vermindern, der etwa 30-35 m bei 7 Tagen Fangdauer beträgt. Die Fallenabstände bestimmen besonders bei kleinen Untersuchungsgebieten deren Ausstattung mit Bodenfallen. Auf die synökologische Bearbeitung von Gebieten, in denen weniger als 4-7 Fallen aufgestellt werden können, sollte verzichtet werden (Baars 1979). Bei größeren (homogenen) Untersuchungsgebieten empfiehlt sich die Konzentration der Fallen auf deren Kernbereich, um Randeffekte auszuschließen, wobei dennoch der Fallenabstand so groß als möglich zu wählen ist (Baars 1979). Das Verteilungsmuster der Fallen (zufällig oder gleichmäßig) hat keinen signifikanten Einfluß auf das Fangergebnis, wie Simulationen mit einem Computermodell bewiesen.

Der eingesetzte Fallentyp muß dem Ziel der Untersuchung entsprechen. Vor allem Öffnungsumfang (bzw. -radius) und -form, Fangflüssigkeit, Fallenmaterial und -konstruktion sind zu optimieren. Das Untersuchungsziel wird auch wesentlich vom gleichzeitigen Einsatz anderer Erfassungsmethoden beeinflußt. Durch die notwendige Einschränkung der Zielgruppen des Bodenfallenfanges (siehe Kap. 1 und 4) sind synökologische Fragestellungen im allgemeinen nur durch einen wohlabgestimmten Komplex von Methoden zu lösen (Adis 1979, Roth 1984/85, Skuhravý 1964, Janetschek 1982, J. K. Müller 1984, Grimm et al. 1974, Dennison & Hodkinson 1984b, Dunger & Fiedler 1989, Franke et al. 1988). Sollen bevorzugt größere Tiere (Groß-Carabiden bis hin zu Kleinsäugern) gefangen werden, ist ein größerer Öffnungsradius angeraten (Luff 1975, Novak 1969). Kleinere Tiere werden durch kleinere Fallen effizienter gefangen (Braune 1974, Adis 1979). Die Fluchtmöglichkeit aus der Falle, mangelnde Bündigkeit des Fallenrandes mit dem Boden und andere Probleme sowie wachsender Einfluß der Fallen auf das Mikroklima mit zunehmender Öffnungsfläche können die normalerweise lineare Beziehung zwischen Fallenöffnungsumfang und Fängigkeit bei einigen Arten "abknicken" lassen (Braune 1974, Novak 1969). Dadurch wird das Optimum des Öffnungsumfanges nach oben begrenzt. Die untere Grenze ergibt sich durch die von den Tieren überschreit- bzw. überspringbare Distanz. Als Faustregel kann man einen Fallenöffnungsdurchmesser von der doppelten Körperlänge der größten zu fangenden Tiere annehmen (Tab. 5). Will man gezielt größere Tiere fangen, dann kann man dem kleineren "Beifang" durch entsprechende Löcher bzw Siebe im Fallenboden das Entkommen ermöglichen, um deren möglichen Ködereffekt zu begrenzen und aus ethischen Gründen (kein sinnloser Massenmord!).

Vergleiche verschiedener Fallenmaterialien ergaben (Luff 1975), daß bei Wahlmöglichkeit Glasfallen der Vorzug vor Plastik- und Blechfallen zu geben ist, da diese durch ihre glatteren Innenwände die geringsten Fluchtverluste aufweisen. Plastikfallen bieten demgegenüber die Vorteile größerer Robustheit, geringeren Gewichts und, bei aufwendigeren Fallenkonstruktionen, geringeren Preises. Als Form der Fallenöffnung ist eindeutig der Kreis zu favorisieren, da er keine fluchtbegünstigenden Ecken und gute mathematische Handhabbarkeit bei der Auswertung der Ergebnisse bietet.

Die Entscheidung über den Einsatz von Fangflüssigkeit ist sehr vielschichtig. Sollen durch den Fallenfang Aktionsradiusmessungen (und abgeleitet die Berechnung der Abundanz) ermöglicht werden, ist Lebendfang erforderlich. Gleiches gilt, wenn mit dem Fang geschützter bzw. bestandsbedrohter Tierarten zu rechnen ist, um deren unnötige Tötung zu vermeiden. Gegenüber dem Lebendfang bietet der Einsatz von Fangflüssigkeiten den Vorteil geringerer Verluste durch Flucht, Prädation und Kannibalismus. Der Zusatz weniger Tropfen Entspannungsmittel fördert das Einsinken der Tiere und

Tab. 5. Größe und Bauweise von Bodenfallen entsprechend den Zielgruppen des Fallenfanges. Alle Größenangaben sind als Richtwerte zu verstehen. Diese Übersicht wurde unter Verwendung der Arbeiten von Braune (1974), Adis (1979), Luff (1975), Dunger & Fiedler (1989) und Novak (1969) erarbeitet.

Zielgruppen	Fallenöffnung [m]		Fallenkonstruktion
	Durchmesser	Umfang	
Acari, Collembola, Coleoptera u. Araneae <10 mm	0,025-0,08	0,079-0,25	Fraktionsfalle oder abflußloses Gefäß mit Fangflüssigkeit
Coleoptera (bes. Carabidae) u. Araneae >10 mm	0,05-1,3	0,16-4,	Boden mit Gaze (2 mm Poren)
Kleinsäuger	0,2-0,5	0,63-1,57	Boden mit Loch von ca. 10 mm ∅

verringert so zusätzlich die Fluchtverluste. Andererseits ist die, mit vielen Fangflüssigkeiten verbundene, attraktive oder repellente Signalwirkung und die verstärkte Beeinflussung des Mikroklimas unerwünscht.

Diese Verhältnisse werden deutlich durch die Ergebnisse von Lebend- und Formalinfallen, die im NSG "Gülper See" 1985 zum Einsatz kamen, dokumentiert (Tab. 3). Sind bei den meisten Carabiden und Staphyliniden die Fangergebnisse vor allem durch die attraktive Wirkung des Formalins erhöht, erklären sich die geringeren Fangquoten von Lycosidae, Tetragnathidae, Opiliones, Acari, Collembola und teilweise der Carabidae in Lebendfallen vor allem durch Prädation/Kannibalismus. Linyphiidae/Erigonidae, Staphylinidae, Diptera und Hymenoptera werden sowohl durch Prädation/Kannibalismus als auch durch Flucht weniger in Lebendfallen gefangen. Vor allem Verwesung gefangener Kleinsäuger und Großcaraben in der Lebendfalle attrahiert Silphidae.

Als Fangflüssigkeit der Wahl kommen besonders Stoffe in Betracht, die ohne nennenswerte Signalwirkung auf die untersuchten Tiergruppen sind. Außerdem spielen bei der Auswahl der Fangflüssigkeit deren Wirkung auf das Fangmaterial, Giftigkeit, Haltbarkeit und Preis eine Rolle (Tab. 6). Die perfekte Fangflüssigkeit gibt es sicher nicht.

In der Synökologie werden häufig parallele Untersuchungen einer möglichst großen Anzahl unterschiedlicher Zielgruppen angestrebt. Somit ist eine Verknüpfung der Vorteile des Lebendfanges mit denen des Fanges mit Flüssigkeit bei Minimierung der Nachteile beider Methoden sinnvoll. Die Kombination wäre durch gleichzeitigen Einsatz beider Fallentypen erreichbar, ist dann aber mit dem Mangel unzureichender Vergleichbarkeit der Ergebnisse infolge der hohen Komplexität der Meßfehler behaftet. Da bevorzugt größere Tiere (>6 mm) lebend benötigt werden, während die bedeutenden Prädationsverluste kleinerer Tiere mittels Fangflüssigkeit verringert werden können, bietet die "Fraktionsfalle" hier einen Ausweg (Abb. 8). Wie bereits von Balogh (1958) und Skuhravý (1964) vorgeschlagen, wird bei diesem Fallentyp auf halber Höhe ein Gazeeinsatz eingebaut. Die Maschenweite kann je nach Größe der lebend zu fangenden Tiere variiert werden. Der Autor verwandte Gaze von 2 mm Maschenweite. Alle Tiere, die die Maschen passieren, fallen in die Fangflüssigkeit, die anderen verbleiben im oberen Lebendteil. Der Vergleich von Fangergebnissen parallel aufgestellter Lebend-, Formalin- und Fraktionsfallen mit Glycerol zeigt, daß die Meßfehler durch Prädation/Kannibalismus und chemische Attraktion/Repellenz in Fraktionsfallen wesentlich verringert sind. Um die Auswirkungen des Gazeeinsatzes auf den Fang zu prüfen, wurden 1989 im FND "Rutsch" während 4 Fangperioden von jeweils einer Woche insgesamt 15 Glasfallen und 15 Fraktionsfallen, jeweils mit Glycerol-Wasser-Gemisch, eingesetzt. Die Ergebnisse (Tab. 7) zeigen deutlich, daß bei Carabidae, Diptera, Staphylinidae, Chalcoidea und Lumbricidae keine wesentlichen Unterschiede zwischen beiden Fallentypen auftreten. Die Verluste der Collembola, Acari, Hahniidae, Cynipoidea und z.T. auch der Erigonidae/Linyphiidae werden durch den fraktionierten Fang deutlich verringert. Das ist nicht zuletzt auch ein

Tab. 6. Überblick über die Eigenschaften häufig verwendeter Fangflüssigkeiten. Beurteilungskriterien: 1. Toxizität. 2. Haltbarkeit. 3. Richtpreise in DM für 1 l einsatzfähige Fanglösung in der üblichen Konzentration. 4.-8. Wirkung auf das Fangmaterial: 4. mazerierend; 5. aufhellend oder färbend; 6. quellend; 7. härtend; 8. hygroskopisch. Erläuterung der Symbolik: +: Kriterium trifft vollkommen zu; /: Kriterium trifft in geringem Maße zu; –: Kriterium trifft nicht zu; 0: keine Angaben. Die Tabelle wurde unter Verwendung der Arbeiten von Dunger (1963), Růžička (1988b), Heydemann (1956a) und Dunger & Fiedler (1989) zusammengestellt.

Fangflüssigkeit	Beurteilungskriterien							
	1	2	3	4	5	6	7	8
Ethandiol (Ethylenglykol, Glykol)	–	mäßig-gut	56,62-84,50	/	+	/	–	+
Propantriol (Glycerol)	–	mäßig-gut	15,14	–	+	/	–	+
Methanal-Lösung (Formaldehyd)	+	gut-sehr gut	1,05-1,84	–	–	–	+	–
Methanol	+	Verdunstung	6,16	–	0	0	–	/
Ethanol/Brennspiritus	–	Verdunstung	45,50/2,00	/	/	–	/	+
Ethanol-Ethansäure-Wasser-Gemisch	–	Verdunstung	46,18	–	–	+	–	+
2, 4, 6-Trinitrophenol (Pikrinsäure)	–	(sehr) gut	56,00	–	+	0	0	–
Kaliumbichromat-Lösung	+	(sehr) gut	11,36	–	–	0	0	–
Wasser	–	schlecht	minimal	+	–	+	–	–

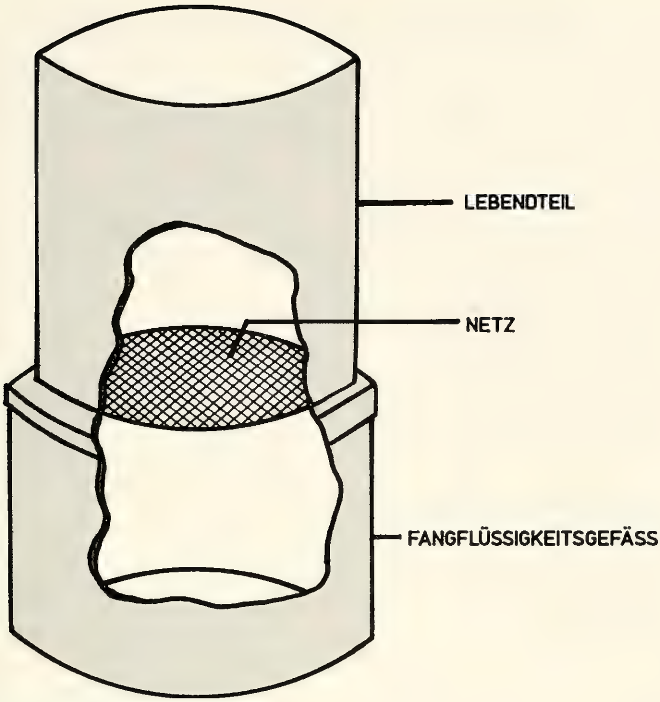

Abb. 8. Aufbau der Fraktionsfalle, schematisch.

Tab. 7. Vergleich der Fangergebnisse der 1989 im FND "Rutsch" parallel aufgestellten Fraktions- und Glasfallen mit Glycerol-Lösung. Alle Angaben der Aktivitätsdichte (M_A) in in $d^{-1} \cdot m^{-1}$.

Taxon	Fraktionsfallen Summe des/der		Glasfallen Summe des/der	
	M_F	M_A	M_F	M_A
Regenwürmer	9	0,049	9	0,048
Myriapoda	21	0,115	72	0,385
Acari	2341	12,848	561	2,999
Phalangiidae	3	0,016	42	0,225
Agelenidae	24	0,132	56	0,299
Lycosidae	7	0,038	17	0,091
Erigonidae/Linyphiidae	97	0,532	84	0,449
Hahniidae	124	0,681	16	0,086
Clubionidae	0	0	4	0,021
sonst. Arachnida	19	0,104	47	0,251
Collembola	12248	67,221	4881	26,091
Carabidae	81	0,444	80	0,428
Staphylinidae	15	0,082	13	0,069
Formicoidea	22	0,121	130	0,695
Erzwespen	23	0,126	32	0,171
Gallwespen	24	0,132	16	0,086
Diptera	106	0,582	131	0,700
Gastropoda	1	0,005	63	0,337
Mammalia	0	0	7	0,037
Sonstiges	84	0,461	138	0,738
Summe	15249	83,689	6399	34,206

Ergebnis der besseren Auslesbarkeit ihres Fanges, denn bei einfachen Glasfallen haften sie häufig an größeren Tieren, Bodenteilchen, Fallaub usw. und werden so übersehen. Besonders Agelenidae, Lycosidae und *Harpactes* erleiden im Lebendteil größere Verluste durch Prädation. Diese können durch das Anbieten von Versteckmöglichkeiten weiter gesenkt werden (Dunger & Fiedler 1989). Bei Formicoidea, Mammalia, Phalangiidae, Gastropoda und evtl. auch Myriapoda (?) sind die Fluchtverluste in Fraktionsfallen größer als in Glasfallen. Das ist zumindest bei den Säugetieren und Schnecken sogar von Vorteil, da diese ohnehin mit beiden Fallentypen nicht quantitativ zu fangen sind, den Fang verunreinigen und zu unerwünschten Ködereffekten führen. Bei Formicoidea, Phalangiidae und Myriapoda (Voigtländer 1983) sind die Meßfehler der Bodenfallen, vor allem infolge Hinderniswirkung des Fallenrandes und Flucht aus der Falle, so groß, daß eine Aktivitätsdichtemessung fragwürdig ist. Unter diesem Gesichtspunkt ist die Fraktionsfalle für viele synökologisch orientierte Aktivitätsdichtemessungen optimal. Die Fluchtverluste lassen sich zusätzlich durch den Einsatz von Reusen in den Fallenöffnungsbereich verringern (Dunger & Fiedler 1989). Die unterschiedlichen Zielgruppen von Fraktionsfallen- und Glasfallenfang finden auch in der Größenklassenpyramide des Fanges ihren Ausdruck (Abb. 2).

Die Veränderung der Fallenumgebung und der "digging-in effect" werden durch die von J. K. Müller (1984), Dunger (1963) und Adis (1976) vorgeschlagenen Einsatzfallen minimiert sowie die Bündigkeit der Falle erhöht. Bei geeignetem Boden läßt sich durch Ausstechen der Fallenlöcher mit einem größenangepaßten Bodenbohrer eine ähnliche Wirkung erzielen.

Zwar beeinflussen die vom Autor angewandten lackierten Pappdächer das Mikroklima vergleichsweise wenig, aber eine weitere Verringerung dieses Einflusses durch luftdurchlässige Stoffdächer (Nylon oder ähnlicher imprägnierter Stoff) ist denkbar. Gegen Fallaub- und andere feste Immissionen von oben schützen Netzdächer (Růžička 1982), ohne das Mikroklima wesentlich zu beeinflussen. Soweit es irgend möglich ist, sollte auf Dächer gänzlich verzichtet werden. Untersuchungsgebiete ohne Gehölzbestockung (Fallaubeinfluß!) bieten bei kurzen Fangperioden diese Möglichkeit. Ein Problem stellt dann allerdings der Niederschlag dar, der die Fangflüssigkeit verdünnt und unter Umständen die Falle voll laufen läßt. Letzteres Problem ist, ebenso wie das Herausdrücken der Fallen durch den Bodenwasserdruck in Feuchtgebieten, mit drainierten Fallen lösbar (Růžička 1982, 1987). Die seitliche Immission von Bodenpartikeln, Fallaub und Mikroarthropoden kann durch immissionsgeschützte Fallen, wie sie Dunger & Engelmann (1978) vorschlagen, minimiert werden. Da durch die Immissionsschutzwände Makroarthropoden von der Falle abgehalten werden, sind diese Fallen nur für besonders immissionsgefährdete Untersuchungsgebiete zur Aktivitätsdichtemessung der Mikroarthropoden (≤5 mm) geeignet.

Durch technische Abwandlung der Bodenfalle wurden Aktivitätsdichtemeßgeräte für sonst schwer zugängliche Habitate konstruiert. Das ermöglichte den Fang in Geröllfeldern (Růžička 1982, 1988a, b), unter geschlossenen Schneedecken (Granström 1973) und im Inneren des Bodens (Kaczmarek 1978, Loreau 1987, Heydemann 1956a) sowie auf der Wasseroberfläche (Renner 1986, Růžička 1982).

5.2 Aktionsradiusmessung

Aktionsradiusmessungen müssen, sollen sie zur Abundanzberechnung brauchbar sein, folgenden Ansprüchen genügen:

1. repräsentativ für die Semaphorontengruppe bzw. deren epigäischen Teil sein,
2. unter natürlichen Bedingungen gemessen sein und
3. einen ausreichenden Zeitraum durchschnittlich repräsentieren.

Das schränkt die methodischen Möglichkeiten erheblich ein. So fordert der erste Anspruch nicht nur ausreichend große Individuenzahlen für die Aktionsradiusmessung, sondern darüber hinaus eine ausreichende Repräsentanz verschiedener Mobilitätsgruppen der Semaphorontengruppe. Dabei müssen sowohl geschlechts- und altersabhängige als auch physiologisch bedingte Differenzierungen Beachtung finden. So wiesen Baars (1979, 1979/80) und Grüm (1971a, b) bei Carabiden eine Differenzierung der epigäischen Semaphorontengruppe in "random walkers" und "directed walkers" nach. Das Zahlenverhältnis beider Mobilitätsgruppen hat wesentlichen Einfluß auf den Durchschnittsaktionsradius der Semaphorontengruppe, der in die Berechnung der Abundanz Eingang findet. Entsprechend muß der auf seinen Aktionsradius zu untersuchende Teil der Semaphorontengruppe möglichst groß

sein, zumal selbst unter günstigsten Voraussetzungen kaum 100 % Wiederfang erreichbar sind. Damit ist die Messung des Aktionsradius nur bei aktivitätsdominanten (bzw. zum Teil subdominanten) Arten möglich, da nur sie ausreichend zur Verfügung stehen.

Besonders problematisch ist sicher die Forderung nach natürlichen Meßbedingungen. Mit ihr ist verbunden, daß den Tieren ungehinderte Lokomotion in ihrem angestammten Habitat ermöglicht wird (Baars 1979/80, Kuschka et al. 1987). Dadurch sind Labormessungen, der Einsatz laborgezüchteter Individuen und alle Markierungstechniken, die den physiologischen Zustand des Tieres beeinflussen, ausgeschlossen. Als Markierung kommen wohl nur noch bestimmte Farbmarker bzw. Etiketten (Southwood 1966, Nelemans 1986), Mikrogravurtechniken (besonders bei Käfern) (J. K. Müller 1984, Loreau 1984) und radioaktive Präparate (mit Einschränkungen) (Skuhravý 1964, Baars 1979/80, Southwood 1966, Nelemans 1986) in Frage. Der Autor wandte erfolgreich Farbetiketten an, wie sie auch Imker verwenden. Den Anspruch natürlicher Meßbedingungen erfüllen möglicherweise auch Tiere nicht ganz, die vor dem Aussetzen gehältert oder unmittelbar aus der Bodenfalle ausgesetzt werden. Gerade in diesem Punkt sind wohl alle gebräuchlichen Meßmethoden unkorrekt. Meßfehler werden auch durch die, meist unvermeidliche, Aussetzung vieler markierter Individuen an einem zentralen Punkt erzeugt, da hierdurch lokal die Abundanz erheblich erhöht wird. Die Aussetzung kann die lokomotorische Aktivität verändern (Southwood 1966) (siehe Abb. 1).

Die dritte Forderung nach Repräsentanz eines ausreichenden Zeitraumes ergibt sich aus den großen tagesperiodischen und verhaltensbedingten Schwankungen der lokomotorischen Aktivität. Um die circadiane Aktivitätsperiodik zu berücksichtigen, ist ein Mindestmeßintervall von 24 Stunden einzuhalten. Wie repräsentant dieses Intervall für die gesamte Fallenfangperiode ist, hängt wesentlich von der Übereinstimmung der aktivitätsbeeinflussenden Faktoren (Abb. 1) in beiden Zeiträumen ab. Insbesondere die Witterung unterliegt erheblichen Schwankungen. Eine zu große Ausdehnung des Aktionsradius-Meßintervalls verbietet sich aber, da mit der Zeit die Wiederfangwahrscheinlichkeit stark sinkt und das gesamte Faktorengefüge der lokomotorischen Aktivität langperiodische Veränderungen aufweist. Der häufig praktizierte Wiederfang in Bodenfallen (Adis 1979, Loreau 1984, Skuhravý 1956a, b und andere) ist mit zu großen Fehlern behaftet, denn der Zeitraum zwischen Aussetzung und Wiederfang ist unbekannt und folglich ist die zurückgelegte Distanz nicht zeitbezogen darstellbar.

Die Diskussion der Ansprüche an eine Aktionsradiusmessung verdeutlicht die großen Einschränkungen und Meßfehler, denen diese zwangsläufig unterliegt. Bereits Markierung und Wiederfangwahrscheinlichkeit schränken das Größenspektrum der Tiere, deren Aktionsradius meßbar ist, auf ≥6 mm ein, wobei die Wiederfangquote teilweise gar erst bei Tieren ≥15 mm statistisch gesicherte Aussagen ermöglicht. Abundanzwerte kleinerer Tiere sind allerdings oftmals durch andere Methoden (z.B. Quadratmethode, Bodenextraktionsmethoden; Janetschek 1982) wesentlich exakter und effektiver zu ermitteln, so daß eine Aktionsradiusmessung ohnehin entfällt. Als optimal erscheinen derzeit zwei Methoden: die Vermessung der freien Lokomotion radioaktiv markierter Tiere in ihrem Stammhabitat (Baars 1979/80) und die Aktionsradiusmessung anderweitig markierter Tiere auf Aktionsradius-Anlagen im Untersuchungsgebiet (Kuschka et al. 1987). Erstere Methode wird nur für die wenigsten Untersuchungen zur Verfügung stehen. Deshalb sei die zweite Methode besonders erläutert. Eine je nach Gegebenheiten möglichst große kreisförmige Fläche (Mindestdurchmesser 2 m) wird durch eine Kunststoffolie grundabgedichtet, wobei die ausgestochene Grasnarbe bzw. Streuschicht möglichst unverändert auf der Folie plaziert und mindestens einen Monat vor Beginn der Messungen sich selbst überlassen bleibt. Der Wiederfang der markierten und an einem zentralen Punkt der Anlage ausgesetzten Tiere erfolgt durch systematisches Absuchen dieser Fläche (Kuschka et al. 1987). Diese Prozedur ist zwar recht aufwendig, man kann aber namentlich bei Großcaraben damit rechnen, 100 % der auf der Anlage verbliebenen Individuen wiederzufangen. Ein Nebeneffekt des Absuchens ist die Möglichkeit der direkten Abundanzermittlung auf der Anlage. Diese Abundanzen sind zumindest als Richtwerte brauchbar.

Wie Computermodellierungen der Zufallsbewegung ergaben, paßt sich die Wahrscheinlichkeit (h) der resultierenden Entfernungen des Tieres vom Startpunkt (entspricht dem gemessenen Aktionsradius r_i) etwa an die Dichtefunktion (Weber 1980) der Form

2. $h = a \cdot r_i^c \cdot e - r_i/b$

an (Abb. 9). Dabei wird der Faktor a von der Gesamtzahl der gemessenen Aktionsradien und der Klassengröße bestimmt. Da er aber auf die Zielgröße, den mittleren Aktionsradius (r_{Arw}), keinen

Einfluß hat, ist er hier irrelevant. Der mittlere Aktionsradius wird allein von den beiden Exponentenfaktoren b und c bestimmt.

Wie Abb. 9 zeigt, entspricht das Modell gut den Verhältnissen im Populationsteil der "random walkers" von *Carabus hortensis* einer beispielhaften Untersuchung im FND "Rutsch" (1988). Der mittlere Aktionsradius der "random walkers" (r_{Arw}) ist von der Zeitdauer der Bewegung (t) und deren Geschwindigkeit (v) abhängig:

$$3.\quad r_{Arw} = (-0.00071\ t + 1{,}24) \cdot \sqrt[3]{t^2} \cdot v$$

wie sich in Auswertung der Computersimulation ergab. Somit läßt sich die Geschwindigkeit der Zufallsbewegung berechnen als:

$$4.\quad r_E = \frac{r_{Arw}}{(-0.00071\ t + 1{,}24) \cdot \sqrt[3]{t^2}}$$

Unter der Voraussetzung, daß die Geschwindigkeiten von "random walk" und "directed walk" gleich groß sind, berechnet sich der Aktionsradius der gerichteten Bewegung ("directed walk"; r_{Adw}) als Produkt der Geschwindigkeit und der Zeit. Durch entsprechende Umformung kommt man zu einer Formel, die eine Berechnung von r_{Adw} aus dem mittleren Aktionsradius der Zufallsbewegung (r_{Arw}) ermöglicht:

$$5.\quad r_{Adw} = r_{Arw} \cdot \frac{t}{(-0.00071\ t + 1{,}24) \cdot \sqrt[3]{t^2}}$$

Das Verhältnis zwischen den berechneten Aktionsradien entspricht recht gut den Beobachtungen von Baars (1979/80). Der durchschnittliche Aktionsradius der Semaphorontengruppe pro Tag (r_A), der als Ziel der Untersuchung in die Berechnung der Abundanz eingehen soll, kann nun anteilig aus beiden mittleren Aktionsradien bestimmt werden:

$$6.\quad r_A = \frac{n_{rw} \cdot r_{Arw} + n_{dw} \cdot r_{Adw}}{N}$$

Dabei sind n_{rw} und n_{dw} jeweils die Anzahl der ausgesetzten Tiere, die als "random walkers" bzw. "directed walkers" einzustufen sind und N ist die Anzahl aller zur Aktionsradiusmessung ausgesetzten Tiere. In vielen Fällen kann man davon ausgehen, daß die auf der Aktionsradiusanlage vorgefundenen Tiere "random walkers" sind und die Tiere, die die Anlage verlassen haben "directed walkers". Das ist aber von Fall zu Fall zu prüfen. Dazu hat sich die graphische Darstellung der gemessenen Aktionsradien in einer solchen Dichtefunktion bewährt. So erkennt man am leichtesten, welcher Teil der ausgesetzten Tiere eine Zufallsbewegung zeigte.

5.3 Auswertung der Fangergebnisse

Der erste Auswertungsschritt ist immer die Berechnung der Aktivitätsdichte aus dem Fallenfang. Entsprechend der Definition der Aktivitätsdichte als "die Zahl an Individuen, die pro Zeitabschnitt eine Grenzlinie bestimmter Länge überschreiten." (Heydemann 1961b, p. 538), kann sie aus dem Fallenfang nach folgender Formel berechnet werden (Růžička 1987):

$$7.\quad M_A = \frac{M_F \cdot 24}{n_F \cdot t_F \cdot U_F} \quad [\,d^{-1} \cdot m^{-1}]$$

M_A = Aktivitätsdichte
M_F = Anzahl gefangener Tiere der Semaphorontengruppe
n_F = Fallenzahl im Untersuchungsgebiet
t_F = Dauer der Fangperiode in h
U_F = Umfang der Fallenöffnung in m

Sie wird in eine Primärdatenliste eingetragen, die neben der vollständigen Auflistung der gefangenen Semaphorontengruppen auch deren Fanganzahl (M_F) enthalten sollte.

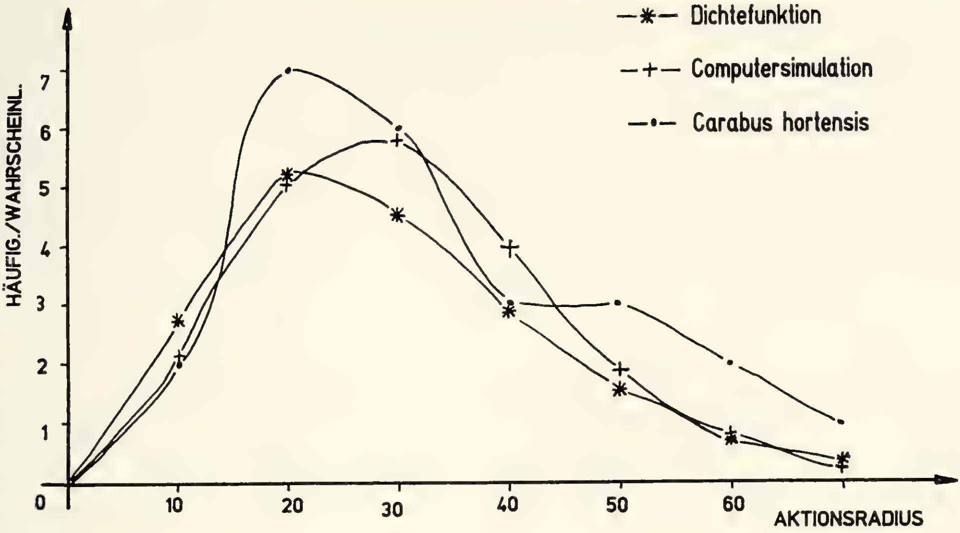

Abb. 9. Häufigkeiten resultierender Entfernungen sich zufällig bewegender Tiere entsprechend eines Computermodells, Wahrscheinlichkeiten dieser Entfernungen entsprechend der Dichtefunktion (2) und die tatsächlichen Häufigkeiten gemessener Aktionsradien bei *Carabus hortensis* am 22./23.5.1988 im FND "Rutsch" im Vergleich.

Die Herausstellung der produktionsökologisch bedeutenden Semaphorontengruppen kann durch die Berechnung von Aktivitätsdominanzen, als prozentualer Anteil der Aktivitätsdichte der Semaphorontengruppe an der Gesamtaktivitätsdichte der entsprechenden Auswertungskategorie (Konsumtionstyp, Größenklasse), erleichtert werden. Spätestens in diesem Auswertungsschritt sind alle Semaphorontengruppen, deren Aktivitätsdichtemessung mit zu großen Meßfehlern behaftet ist, aus der Rechnung zu eliminieren. Die Anwendung eines Dominanzklassensystems, wie von Engelmann (1978) vorgeschlagen, erhöht die Übersichtlichkeit zusätzlich.

Es steht außer Frage, daß im Zuge der Inventarisierung der Fauna terrestrischer Ökosysteme die Abundanz zumindest der dominanten Artenkombination zu ermitteln ist. Welche Methode hierzu angewandt wird, ist nach deren Aufwand, Effizienz und Genauigkeit zu entscheiden. Die Abundanzberechnung aus Fallenergebnissen kommt durch den relativ hohen Aufwand und die zahlreichen Fehlerquellen nur für diejenigen Arten in Betracht, deren Abundanz mittels anderer Methoden nicht oder schlechter zu ermitteln ist. Das trifft vorwiegend auf epigäische "Läufer" <15 mm (wie z.B. Carabidae, einige Staphylinidae, Lycosidae) zu, deren Aktivitätsdichte hinreichend genau zu messen ist und deren geringe Abundanz Zählungen nach der Quadratmethode o.ä. nur bedingt zuläßt (Dennison & Hodkinson 1984b).

Ein Überblick über Methoden der Abundanzermittlung aus Bodenfallenergebnissen und deren Prämissen wird in Janetschek (1982) gegeben. Die Wegfang-Techniken erfordern eine Ausrichtung des Fallenfanges auf das Ziel der Abundanzermittlung, die durch ihre Artspezifität zum Teil der breiter angelegten synökologischen Zielstellung entgegensteht und sie sind an enge Prämissen gebunden (J. K. Müller 1984). Daher sollen sie nicht weiter betrachtet werden. Markierungs-Wiederfang-Methoden erfordern wesentlich weniger Eingriffe in die Fangmethodik selbst. Die einfachsten Berechnungen, z.B. mittels Lincoln-Index oder Jolly-Methode, gehen von einigen schwer einzuhaltenden und noch schwerer überprüfbaren Prämissen voraus (Southwood 1966, Janetschek 1982). Deshalb sollen im folgenden nur Methoden betrachtet werden, die auf der Berechnung der Abundanz aus Aktivitätsdichte und Aktionsradius beruhen. Fechter (1977) geht davon aus, daß die Tiere eine Zufallsbewegung ausführen. Die damit verbundene Ausbreitung vergleicht er mit der Konzentrationsveränderung von Teilchen durch Diffusionsprozesse. Folgende Berechnungsformel der Abundanz (M/m^2) wurde daraus abgeleitet (die Formelzeichen sind der Symbolik der vorliegenden Publikation angepaßt worden):

$$8.\quad M/m^2 = \frac{M_A \cdot U_F \cdot \ln N}{\pi \cdot r_A^2 \cdot I}$$

$$\text{mit} \qquad I = \frac{1}{d} - \frac{0.57722}{d^2} - \frac{1.31175}{d^3} - \frac{1}{d^4}$$

$$\text{und} \qquad d = \frac{r_A^2}{\ln(\ln N \cdot r_F^2)} - 1.15444$$

Braune (1974) und Kuschka et al. (1987) leiten die Abundanzformeln aus der Fangwahrscheinlichkeit der Tiere ab. Angepaßte Formel nach Braune:

$$9.\quad M/m^2 = \frac{M_A \cdot U_F}{2 \cdot r_A \cdot r_F}$$

nach Kuschka et al.:

$$10.\quad M/m^2 = \frac{\dfrac{M_A \cdot U_F}{r_F}}{\left(r_x^2 \cdot \arcsin r_x + r_F \sqrt{(r_x^2 - r_F^2)}\right)_{r_F + 0.0001}^{r_F + r_A}}$$

Unter Verwendung dieser drei Formeln wurden die Abundanzen für einige Carabiden auf der Basis von Aktivitätsdichtemessungen im FND "Rutsch" exemplarisch berechnet. Das Ergebnis dieses Vergleichs ist Tabelle 8 zu entnehmen. Alle drei Berechnungsformeln ergeben jeweils Abundanzwerte ähnlicher Größenordnung. Die annähernde Deckungsgleichheit der Ergebnisse nach Braune (1974) und Kuschka et al. (1987) überrascht etwas, sind doch die beiden Berechnungsformeln recht unterschiedlich. Im Vergleich zu diesen sind die Abundanzwerte nach Fechter (1977) immer kleiner, maximal um das etwa fünffache. Leider liegen keine direkten Abundanzmessungen vor, die als Kriterium der Richtigkeit der berechneten Werte dienen könnten.

Wie bereits erläutert, erfordert die zeitliche Veränderlichkeit von Abundanz und lokomotorischer Aktivität Untersuchungen über mindestens eine Vegetationsperiode, um synökologisch vergleichbare Ergebnisse zu erhalten. Derartige Untersuchungszeiträume bieten gleichzeitig die Chance der Dokumentation zeitlicher Abläufe in Biozönosen. Hier sind an erster Stelle die jahresperiodischen Veränderungen der Aktivitätsdichte zu nennen (Dennison & Hodkinson 1984a). Diese sind am besten in einer Ergebnistabelle zusammenzustellen, die sowohl die komplette Liste der Semaphorontengruppen der gesamten Vegetationsperiode als auch deren Aktivitätsdichten, -dominanzen und Abundanzen (soweit ermittelt) in allen Fangperioden enthält. Monatliche Fänge von jeweils einer Woche während der Vegetationsperiode ermöglichen sowohl die Beschreibung der circaanuellen Rhythmik der untersuchten Populationen als auch die Minimierung zeitabhängiger Störfaktoren (vgl. Kap. 4). Die zwischen

Tab. 8. Vergleich der Ergebnisse der Abundanzberechnungen nach Fechter (1977), Braune (1974) und Kuschka et al. (1977) auf der Basis von Aktivitätsdichte- und Aktionsradiusmessungen im FND "Rutsch" 1988. Angaben von M_A in $d^{-1} \cdot m^{-1}$, von r_A in $m \cdot d^{-1}$.

			M/m² nach		
M_F	M_A	r_A	Kuschka et al.	Fechter	Braune
15	1,792	0,524	10,85	5,75	10,74
71	7,221	0,473	48,44	35,47	47,92
15	1,520	0,322	15,08	10,61	14,84
36	4,444	0,396	35,75	28,50	35,29
29	1,780	0,716	7,86	3,64	7,81
18	1,104	0,448	7,84	4,71	7,74
8	0,707	1,043	2,14	0,46	2,13
38	3,356	0,304	35,29	37,48	34,68
12	1,053	1,178	2,82	0,76	2,81
54	4,740	0,863	17,35	9,00	17,25
66	5,794	0,419	43,93	32,31	43,40
7	0,606	0,496	3,88	1,62	3,84

den Fangperioden liegende Ruhezeit von 3 Wochen ist ausreichend, um Leerfangeffekte zu kompensieren. Der durch sie gegebene Informationsverlust ist vertretbar.

Bei Beachtung der notwendigen Vorkehrungen zur Verminderung von Meßfehlern vermag die Bodenfallen-Fangmethode Aktivitätsdichte- und Abundanzwerte für eine begrenzte Semaphorontengruppe innerhalb des ökosystematischen Konnex zu liefern. Der weiter gehende Anspruch der Synökologie, umfassendere Funktionen im Ökosystem zu untersuchen, verlangt deren Kombination mit anderen quantitativen Erfassungsmethoden. Eine Zukunftsaufgabe besteht deshalb darin, ergänzende Methoden zu entwickeln, die, bei Kompatibilität untereinander, einen synökologischen Methodenkomplex bilden.

Zusammenfassung

Der Bodenfallenfang ist eine Methode zur Messung der Aktivitätsdichte laufaktiver, fallengängiger Semaphoronten der Bodenoberfläche. Das Ergebnis wird besonders von folgenden Meßfehlern in unterschiedlicher Weise beeinflußt: Kannibalismus und Prädation, Flucht, attraktive und repellente Signalwirkungen, künstlich stimulierte Aktivität, Weg- und Leerfangeffekte, Hinderniswirkung des Fallenrandes, Immission und Einschleppung von Organismen in die Falle. Durch entsprechende Vorkehrungen und Einsatz aufgabenangepaßter Fallentypen können diese Meßfehler weitgehend verringert werden, wenn der Einsatz des Bodenfallenfanges auf geeignete Semaphorontengruppen beschränkt wird. Für synökologische Fragestellungen ist besonders die "Fraktionsfalle" mit Glycerol als Fangflüssigkeit geeignet. Mit Hilfe des separat zu messenden Aktionsradius kann für Semaphoronten ≥ 6 mm aus der Aktivitätsdichte zusätzlich die Abundanz berechnet werden. Die Bodenfalle ist in einen Komplex synökologischer Methoden abgestimmt einzuordnen.

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Index der Formeln

1. Mindestabstand von Fallen, um Wegfangeffekte auszuschließen.
2. Dichtefunktion der Wahrscheinlichkeiten für das Auftreten einzelner Aktionsradien bei Zufallsbewegung von Tieren von einem zentralen Startpunkt aus.
3. Der mittlere Aktionsradius der Zufallsbewegung als Funktion von Dauer und Geschwindigkeit der Bewegung.
4. Geschwindigkeit der Zufallsbewegung.
5. Berechnung des mittleren Aktionsradius der gerichteten Bewegung aus dem Aktionsradius der Zufallsbewegung.
6. Berechnung des durchschnittlichen Aktionsradius der Semaphorontengruppe.
7. Berechnung der Aktivitätsdichte aus dem Fallenfang.
8. Berechnung der Abundanz aus der Aktivitätsdichte nach Fechter (1977).
9. Berechnung der Abundanz aus der Aktivitätsdichte nach Braune (1974).
10. Berechnung der Abundanz aus der Aktivitätsdichte nach Kuschka et al. (1987).

In den Formeln eingesetzte Symbole: $\mathbf{r_E}$: Mindestabstand der Fallen, um Wegfang zu vermeiden; $\mathbf{r_{Arw}}$: mittlerer Aktionsradius des "random walk"; $\mathbf{r_{Adw}}$: mittlerer Aktionsradius des "directed walk"; $\mathbf{r_A}$: durchschnittlicher Aktionsradius der Semaphorontengruppe; $\mathbf{r_i}$: gemessener Aktionsradius = resultierende Entfernung des Tieres vom Startpunkt; $\mathbf{r_F}$: Radius der Öffnung der Bodenfalle; $\mathbf{r_x}$: variabler Radius entsprechend den Grenzen des Integrals; **t:** Fangzeit in Tagen; $\mathbf{t_F}$: Dauer der Fangperiode in Stunden; **h:** Wahrscheinlichkeit für das Auftreten des Aktionsradius r_i; **v:** Geschwindigkeit der Fortbewegung; $\mathbf{n_F}$: Fallenzahl im Untersuchungsgebiet; $\mathbf{n_{rw}}$: Anzahl der "random walkers"; $\mathbf{n_{dw}}$: Anzahl der "directed walkers"; **N:** Gesamtzahl der zur Aktionsradiusmessung ausgesetzten

Tiere; M_A: Aktivitätsdichte in $d^{-1} \cdot m^{-1}$; M_F: Anzahl gefangener Tiere der Semaphorontengruppe; M/m^2: Abundanz in m^{-2}; U_F: Umfang der Fallenöffnung in m; **I; d:** Faktoren der Abundanzformel nach Fechter (1977); **a; b; c:** Faktoren bzw. Exponenten der Dichtefunktion.

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3. Gosliner, T. M., D. W. Behrens & G. C. Williams: Coral Reef Animals of the Indo-Pacific. Animal Life from Africa to Hawaii Exclusive of the Vertebrates. – Sea Challengers, Monterey/CA, 1996. vi + 314 pp. ISBN 0-930118-21-9.

The first 15 pages of this handy volume are covered by some general paragraphs on determination, classification and naming of animals as well as on coral reef ecology. The main part of the book is composed of indeed beautiful color photos of marine invertebrates of all but the microscopic phyla together with information on their natural history and distribution. It is significant for our still extremely poor knowledge of even the marine macrofauna that a large portion of all (over 1.100) species presented could not be given a name. All photos are of excellent quality and make the reading of the book a true pleasure for the eyes, and even the expert is fascinated by the colorful beauty of sponges, corals, ctenophores, polyclad flatworms, nemertineans, molluscs, pycnogonids, crustaceans, echinoderms, and ascidians. A fine glossary, an informative reference list, and the index are found at the end of this volume.

According to the backside cover this volume has been produced "for the diver, for the aquarist, for the biologist". Indeed, I recommend the book exactly for these groups of readers. Without any hesitation, the low price for more than 300 pages of wonders is well-invested. G. Haszprunar

4. Reid, D. G.: Systematics and Evolution of *Littorina*. – Ray Society, London, 1996. x + 463pp. ISBN 0-903874-26-1 hbk.

The genus *Littorina* is one of the most studied in world's malacology. These "periwinkles" are usually found everywhere on rocky shores of Europe, North America, Russia and Japan. Nevertheless, the systematics of the known 19 species is still debateable and has caused considerable controversy.

David Reid, one of today's foremost malacologists and leading specialist of the family Littorinidae, presents his second monumental work. Based on original anatomical and genetic studies he describes in detail and superbly illustrates shells, radulae and anatomies of all living species of *Littorina*. He also presents a cladistic analysis of morphological characters, further includes the fossil record and data on allozyme frequencies and DNA sequences, and finally presents an overall approach of the phylogeny at the species level. Based on this analysis mechanisms of biogeography, speciation and adaptive radiation in *Littorina* are explained. The extensive bibliography comprises more than 1.500(!) references.

Needless to say that this work will become a landmark in *Littorina* research. Moreover, it gives a wonderful example for how today's systematic malacology should be, and that monographs are far from being outdated. I only can congratulate the author and strongly recommend the volume to everybody who wants to study systematic malacology – here you have the highest standard represented. I also thank the Ray Society, that offers this excellent but highly specialized book to an even reasonable prize. G. Haszprunar

5. Hausmann, K. & N. Hülsmann: Protozoology, with contribution by Hans Machemer, Maria Mulisch, and Günther Steinbrück. – Georg Thieme Verlag, Stuttgart-New York, 1996. 338 pp. ISBN 3-13-110301-9.

This book is an up-dated English translation of Hausmann's paperback "Protozoologie" of 1985, which is thus now available for the whole English-speaking world. The textbook is divided into three main parts. Part I (Introduction and Overview: pp. 1-31) concerns the history of protozoology and the principle cellular organization of protists. The latter term and also "Protozoa" are purely descriptive, because of their clear paraphyletic nature. Part II (Evolution and Taxonomy: pp. 33-148) provides a systematic survey throughout the eukaryotic unicellular taxa. Given the dramatic and continuous changes in our knowledge of protist phylogeny during the last decade. The authors restrict themselves to provide descriptions of the main taxa rather than to comment at length on interrelationships, although hypotheses on the latter subject are also given briefly. Part III (Selected Topics of General Protozoology: pp. 149-300) reports on comparative morphology and physiology of protists, including molecular biology, behaviour and ecology. The book is provided with an extensive glossary (pp. 301-311), a well-organized bibliography (pp. 313-322), and an index (pp. 323-338) which finalizes the volume.

The text of the whole book is very well written and provides an excellent survey on the subject. In particular I like the very instructive figures and photos (light and electron microscopy), which are of highest quality throughout the volume. The only poor matter about this book is its high price which probably will prevent most students from buying it. A low-price paperback edition of this excellent textbook on protozoology is urgently wanted. G. Haszprunar

6. Nudds, J. R. & C. W. Pettitt (eds.): The Value and Valuation of Natural Science Collections. – Geological Society Publishing House, Bath/U.K., 1997. vii + 276 pp. ISBN 1-897799-76-4 hbk.

This volume represents the proceedings of an international conference with the same title held in Manchester 1995 and includes no less than 47 articles on the subject. The contributions are organized in three main parts and deal with scientific, cultural and financial value of collections. All kinds of natural history collections are concerned: zoology (excluding zoos), botany (including botanical gardens and semen banks), microbiology, paleontology, geology and mineralogy.

As to be expected, the range of opinions and points of view of all aspects mentioned differ significantly between authors depending not only on their personality but also on the local circumstances of his/her institution. Necessarily the scientific-cultural-financial value of each collection has to be evaluated in its distinct socio-economic environment. For instance, it is interesting to see that the Anglo-American world is much more ready to accept a cultural value of a natural history collection than mid-European countries such as Germany. Concerning the latter statement, I feel quite unhappy – and it might be significant – that not a single contribution of the whole volume concerns any German collection or is from a German author. Beside museums of the U.K., one finds institutions of Belgium, Czechia, Ireland, Italy, Poland, Portugal, Romania, Russia, Spain, The Netherlands, furthermore Australia, Brazil, Canada, India, U.S.A., and even Zimbabwe are represented.

In particular, the article by F. D. P. Cotterill from the last mentioned state, "The second Alexandrian tragedy, and the fundamental relationship between biological collections and scientific collections", includes a hall-mark and should become available to Governments and science foundations all over the world. The same is true for the brilliant but unfortunately very hidden (pp. 211-214) "International Accord on the Value of Natural Science Collections" which otherwise would not have even found its way to the Director of the Zoologische Staatssammlung in Munich (the author), and obviously our ministeries are entirely unaware of it.

This is a book by specialists for specialists and certainly not for the broad public. Nevertheless, I strongly recommend it to all who are interested in or responsible for natural history collections – it is more than worthwhile to read, to think and to discuss about its contributions.

G. Haszprunar

7. Mauersberger, G.: Urania-Tierreich. Vögel. – Urania Verlag, Leipzig (1995). 550 S., über 250 Farbfotos. ISBN 3-332-00500-6.

Ich kann mich noch gut an meine Studienzeit erinnern, in der ich Bücher dieser Art verschlang, um endlich eine Gesamtschau über die Klasse Vögel zu gewinnen. Nun ist das bekannte "Urania Tierreich – Die große farbige Enzyklopädie" noch einmal neu aufgelegt worden. Anordnung nach systematischen Gesichtspunkten und Text blieben im wesentlichen gleich. Unter dem geschrumpften Format (jetzt 15.2 × 22 cm, früher 18.7 × 27.5 cm) gab man die mehrseitigen zusätzlichen Farbtafeln auf. Dafür erhalten die einzelnen Familien insgesamt 1-3 neu ausgewählte, qualitativ gute Farbfotos typischer Vertreter, doch bleiben einige, besonders die amerikanischen Vorsingvögel (Bronchienschreier), ganz ohne Farbabbildungen. Der Text ist erzählend, auf die Dauer ermüdend: nach den Familiencharakteristika werden wenige Arten exemplarisch behandelt, wobei viel Platz für Gefiederbeschreibungen der nicht abgebildeten Arten verbraucht wird. Besser hätte man stattdessen gleich die Farbfotos dieser Arten dazugestellt. Über (Brut-)Biologie und Besonderheiten der ca. 1500 Arten kann man nur aus dem Text erfahren. Wer eine einbändige knappe Enzyklopädie der Vögel wünscht, mag hiermit seinen Bücherschrank aufstocken. Für den modernen Ornithologen wird dieses etwas altbackene Werk kaum mehr als Nachschlagequelle dienlich sein.

T. Mischler

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INHALT - CONTENTS

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Catalogue and bibliography of the genus *Euops* Schoenherr

(Insecta, Coleoptera, Curculionoidea, Attelabidae)

Alexander Riedel

Riedel, A. (1998): Catalogue and bibliography of the genus *Euops* Schoenherr (Insecta, Coleoptera, Curculionoidea, Attelabidae). – Spixiana **21/2:** 97-124

An annotated catalogue of the genus *Euops* Schoenherr is given. Currently the genus *Euops* comprises 7 subgenera, 134 species and 10 subspecies recognized as valid. Sixteen species names are included as synonyms. Separate, alphabetically arranged catalogues are provided for the genus-group names and for the species of each of the following regions: Australian, Ethiopian, Madagasy, Oriental, Palearctic, Seychelle Islands, Wallacea. *Euops viridiceps* Voss is designated as type species for the subgenus *Neosynaptops* Voss.

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Introduction

This annotated catalogue is the first part of an ongoing study on the taxonomy, phylogeny and biology of the genus *Euops* (Attelabidae). Since the papers in preparation will be dealing with the systematics of single selected species groups, it appears appropriate to provide an overview of the world fauna beforehand. The catalogue of Attelabidae by Dalla Torre & Voss (1930) with a supplement by the same authors in 1953 already is out of date, is partly incomplete and the authors have overlooked some nomenclatural problems. Herein, I provide an updated catalogue, which reviews – and where necessary clarifies – the nomenclature of the genus before results of revisionary work are published.

If a classification is not to preclude the view to the natural relationships within a group, it has to be based on sound phylogenetic hypotheses. These are still missing for *Euops*. The existing names for subgenera may later be used with the same or, more likely, with a different taxonomic range as the respective authors had in mind when introducing them. As used in the past, *Euops* s. str. appears to be a paraphyletic assemblage of groups that could not be placed in other subgenera, whereas the subgenus *Kobusynaptops* Kôno seems to be separated from the remainder of the genus only because of some conspicuous autapomorphies. The remaining subgenera are of uncertain validity. For this reason I treat the subgenera separate from the species.

However, at least some of the clearer-cut groups seem to be centered within certain zoogeographic regions. The subgenus *Suniops* Voss is confined probably largely to the region of Wallacea, *Charops* Voss is mainly Oriental, but presumably it reaches into the Afrotropical region. Since it appears likely in *Euops* that groups of closely related species are restricted to one of the traditional zoogeographic regions, I decided to give separate "subcatalogues" for each of the traditional regions, i.e. for the Australian, the Ethiopian, the Oriental and the Palearctic regions. Madagascar plus Comoro Islands, the Seychelle Islands and Wallacea (the region consisting mainly of the Philippines, and the Indonesian islands of Sulawesi and Maluku) are treated separately as well. I was encouraged to do this by the fact that the ranges of only four species each extend to a second, neighbouring region. These species are listed in both of the respective "subcatalogues". The species of each region are listed in alphabetical order.

The distributions are given by citing the country containing the reported locality within its current boundaries. In countries where a higher resolution seems desirable (e.g. within Indonesia), the province and/or the specific island is given in brackets.

To verify citations and the original spelling of names, original references were checked where possible. Those "**Not seen**" are so marked in the bibliography. The information was gathered by checking the taxonomic chapters of Zoological Record (for the years 1886-1890 and 1904-1994/95) and Entomology Abstracts (for the years 1982-1996) and by tracing the references contained in the papers listed in the bibliography below. To reduce the number of possible errors a cross check was conducted after completion of the manuscript.

The page numbers given in the species catalogue indicate where the name of the respective species is to be found. In the case of a key, information referring to the respective species may start several pages before; whereas in descriptions, it may continue on the following page. In the catalogue of genus-group names it was found useful to give intervals of pages dealing with the respective group; the species included are listed in alphabetical order in brackets following the page interval.

The purpose of this checklist is to sum up only the existing knowledge of the genus *Euops* and to clarify the nomenclature as far as possible. Unpublished distributional records are not included. No attempt is made to reveal synonymies or to clarify the status of "forms" by examining type specimens. In the latter case article 45g of the International Code of Zoological Nomenclature (ICZN) leaves some doubt of the availability of names published as "forms" before 1961. Where an author before 1961 describes specimens from a locality other than the type locality as a different "form" I consider this implying the meaning of subspecific rank, and, according to the code, they have to be treated as such. In cases where there could be doubt if the original author means subspecific rank with his "form", the name is cited under the respective species as it was originally published but should be considered as possibly available by the next revisor.

There is some confusion about the gender of *Euops*. Some authors such as Pascoe, Voss and Zimmerman treated it as feminine, whereas others, such as Faust, Sharp, and Sawada & Morimoto treated it as masculine. This issue is settled by consulting article 30a (ii) of the ICZN: "A genus-group name ending in *-ops* is to be treated as masculine, regardless of its derivation or of its treatment by its author." Where necessary, I have changed ending of the species names according to article 31b.

I mentioned above the problems connected with the use of the subgenera of *Euops*. This situation emphasizes the importance of type species for genus-group names. Type species can be identified and are listed for all but two subgenera: For *Suniops* no type has been designated so far; this should be done after a thorough revision. For *Neosynaptops, E. viridiceps* Voss is designated as type species herein. After describing the species Voss (1930) mentioned that he wanted to establish a new subgenus both for *E. viridiceps* and two other species, namely *E. singularis* Voss and *E. viridiventris* Heller. However, having examined the types of all three species I came to the conclusion that a close relationship between *E. viridiventris* Heller and *E. viridiceps* Voss is unlikely. *E. singularis* Voss surely has to be placed in a very distantly related group. Since the naming of *Neosynaptops* followed the description of *E. viridiceps* Voss, I select it as type species.

According to the ICZN, article 13 (a), Voss (1933a) did not make the genus-group name *Charops* available when using it in combination with *E. armipes* without any description or definition. The actual description was published two years later by Voss (1935a), but then he did not designate a type species according to article 67b-c. However, according to article 13c, *Charops* is fixed by monotypy, since the description of *Charops* and of *E. paradoxus* was combined, although a second species, *E. submetallicus* Voss, was described.

According to article 43 (ICZN, Principle of Coordination) Schoenherr and not Jekel (e. g. cited by Dalla Torre & Voss, 1930) is the author of the subgenus *Euops*.

Although the names of *Euops jekelii* Pascoe (1874), which has, however, been incorrectly quoted by subsequent authors as "*Euops jekeli* Pascoe", and of *Euops jekeli* Roelofs (1876) are differing in one letter, their spelling is deemed to be identical by article 58 (ICZN). So *Euops jekeli* Roelofs is indeed a junior homonym with *Euops willemoesi* Baer as its justified replacement name.

The name of *Euops lespedezae* was used for the first time by Lewis (1879) as "*Attelabrus* [sic] *lespedezae*, Lewis". This was done in a catalogue so there is no description included. However, the author referred to a form described by Roelofs as a variation of *E. splendens*: "*splendens*, var., Roel.". Roelofs (1874) mentions in his description of *E. splendens* "Variété entièrement bleue" which may be the variation Lewis refers to. This would not help much to identify any *Euops* species and fortunately it

does not need to be accepted as a valid description. In his catalogue Lewis (1879) refers only to an author (i.d. Roelofs), but not unambiguously to a published description as required by article 12 (b) of the ICZN. The glossary of the ICZN helps to clarify the meaning of "reference": "A published citation referring to a publication". Thus a sole citation of an author's name cannot be considered a bibliographic reference, at least if the cited person is author of more than one publication. Sharp (1889) later gives the first comprehensive description and uses the name *Euops lespedezae* which he correctly considers a nomen nudum of Lewis. Subsequent authors (e.g. Kôno, Sawada & Morimoto, and Voss) have considered Sharp as the author of *E. lespedezae*, so my interpretation does not change anything. However, the authorship of *E. lespedezae* appeared to me controversial enough to deserve these comments.

There remains some doubt about the date of publication of the type species of *Euops*, *E. falcatus* (Guérin-Méneville). Text and illustrations of Guérin's "Iconographie" appeared separately. According to Cowan (1971) the illustration of *E. falcatus*, along with the heading "*Attelabus falcatus*, Guer." was published in 1833. This alone provides a valid description, so the name *E. falcatus* (Guérin-Méneville) dates back to at least 1833. The text was published in 1844, but here Guérin refers only to his illustrations and to "Voy. Coquille". Obviously he thought he had published the description of *E. falcatus* in an earlier work of his (Guérin-Méneville 1830). I have checked the latter and found pages 108-128 dealing with various species of Curculionoidea, but no *Euops* or *Attelabus* is included. So Guérin's reference must be considered a lapsus and *E. falcatus* was presumably not described before 1833.

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I would like thank K. Klass, T. Saks (both Munich) and C. W. O'Brien (Tallahassee) for useful comments on an earlier version of the manuscript. H. Kojima (Fukuoka) helped with information on difficult to obtain Japanese literature, X. Zhang (presently Tallahassee) suggested improvements of an earlier version and helped with Chinese literature.

Catalogue of genus-group names of *Euops* Schoenherr

Genus *Euops* Schoenherr

[Only papers with a more general aspect are listed here; those that refer to single species are cited in the species catalogues.]

Euops Schoenherr, 1839: 318 [description]; Jekel 1860: 219; Lacordaire 1863: 550; Gemminger & Harold 1871: 2482 [catalogue]; Sharp 1889: 54 [redescription]; Schilsky 1903: 61; Schilsky 1906: 91-93; Hustache 1924: 558-560 [revision of species from Madagascar]; Voss 1924a: 13-65 [monograph]; Voss 1925: 302 [revision]; Kôno 1927: 39-44 [revision of Japanese species]; Lea 1929: 540 [descriptive notes]; Dalla Torre & Voss 1930: 30-37 [catalogue]; Kôno 1930: 14-15 [biology of Japanese species]; Voss 1939b [distribution]; Ter-Minassian 1950: 178 [redescription]; Dalla Torre & Voss 1953: 13-16 [catalogue]; Hirano 1954: 1-9 [revision of Japanese species]; Voss 1958: 14 [key to species from Fujian]; Chûjô & Morimoto 1959: 146 [key to Japanese species]; Morimoto 1962a: 28 [key]; Morimoto 1962b: 335, 339, 340, 352, 363 [morphology]; Sawada & Morimoto 1985: 175-195 [revision of species from Japan, Korea and Taiwan]; Sawada 1986: 42 [key to cradles]; Sawada & Morimoto 1986: 197-205 [biology]; Yoon & Bae 1986: 34 [key to Korean species]; Lee & Morimoto 1988: 235 [description of larva]; Calder 1989: 1209, 1227, figs 11, 108 [alimentary canal and nervous system]; Calder 1990: 456-457, 471, figs.13-14, 141 [soft parts of reproductive systems]; Morimoto 1992: 3 [key to species of Eastern Asia]; Sakurai 1992: 230 [behaviour]; Zimmerman 1994: 542 [historical review, descriptive notes].

Enops [sic]: Schilsky 1903: p. B [key].

Parablops: Schoenherr 1839: 319; Gemminger & Harold 1871: 2482 [catalogue].

Type species: *Euops australasiae* Fahraeus, 1839 [=*Euops falcatus* (Guérin-Méneville, 1838)], by original designation.

Gender: Masculine [according to ICZN Art 30a (ii)].

Subgenus *Charops* Voss

Voss 1933a: 117 [*E. armipes* Voss]; Voss, 1935a: 97-98 [description of subgenus *Charops*; no explicit type designation; *E. paradoxus* Voss; *E. submetallicus* Voss]; Voss 1939a: 62; Dalla Torre & Voss 1953: 13-14 [catalogue: *E. andrewesi* Voss, *E. armipes* Voss, *E. cyaneus* Marshall, *E. paradoxus* Voss, *E. submetallicus* Voss, *E. togoensis* Faust]; Voss 1956a:1142 [*E. togoensis* Faust].

Type species: *Euops paradoxus* Voss, by monotypy.

Subgenus *Euops* Schoenherr [nec Jekel]

Schoenherr, 1839: 318; Jekel 1860: 220 [description of subgenus *Euops; A. falcatus* Guérin-Méneville (designation as type), *E. howitii* Jekel]; Lacordaire 1863: 550 [redescription; *A. falcatus* Guérin-Méneville, *E. howitii* Jekel]; Voss 1924a: 33, 38, 39 [key to species: *E. affinis* Voss, *E. amethystinus* Pascoe, *E. armatipennis* Voss, *E. borneoensis* Voss, *E. buergersi* Voss, *E. clavigerus* Pascoe, *E. divisus* Pascoe, *E. eucalypti* Pascoe, *E. falcatus* Guérin-Méneville, *E. femoralis* Voss, *E. flavomaculatus* Lea, *E. fulgidus* Faust, *E. maculatus* Voss, *E. montanus* Voss, *E. mysolensis* Voss, *E. papua* Heller, *E. strigiventris* Lea, *E. suturalis* Lea, *E. victoriensis* Blackburn, *E. wallacei* Sharp]; Voss 1925: 292, 293 [key to species: Same as listed for Voss 1924a plus *E. viridicollis* Voss]; Dalla Torre & Voss 1930: 30-32 [catalogue: *E. affinis* Voss, *E. amethystinus* Pascoe, *E. armatipennis* Voss, *E. borneoensis* Voss, *E. buergersi* Voss, *E. championi* Voss, *E. clavigerus* Pascoe, *E. cupreosplendens* Macleay, *E. divisus* Pascoe, *E. eucalypti* Pascoe, *E. falcatus* Guérin-Méneville, *E. femoralis* Voss, *E. flavomaculatus* Lea, *E. fulgidus* Faust, *E. maculatus* Voss, *E. montanus* Voss, *E. mysolensis* Voss, *E. niger* Voss, *E. papua* Heller, *E. picipes* Voss, *E. pulchellus* Voss, *E. strigiventris* Lea, *E. suturalis* Lea, *E. tibialis* Voss, *E. victoriensis* Blackburn, *E. viridicollis* Voss, *E. vossi* Heller, *E. wallacei* Sharp]; Voss 1933a: 114-116 [*E. insularis* Voss, *E. sandakanensis* Voss, *E. tonkinensis* Voss]; Voss 1935b: 121 [*E. javanicus* Voss]; Voss 1942: 100 [*E. championi* Voss], 101 [*E. nitidicollis* Voss]; Voss 1945-48: 160 [*E. championi* Voss]; Dalla Torre & Voss 1953: 13 [catalogue: *E. championi* Voss, *E. gardneri* Marshall, *E. ignitus* Voss, *E. insularis* Voss, *E. javanicus* Voss, *E. nigricollis* Marshall, *E. nitidicollis* Voss, *E. sandakanensis* Voss, *E. strigiventris* Lea, *E. tonkinensis* Voss]; Voss 1956b: 124 [*E. testaceus* Voss, *E. femoralis* Voss],125 [*E. wallacei* Sharp]; Voss 1958: 14 [key to species from Fukien], 15 [*E. championi* Voss], Verbreitungsübersicht [distribution in oriental and palearctic region]; Sawada & Morimoto 1985: 181-182 [*E. championi* Voss].

Type species: *Euops australasiae* Fahraeus, 1839 [= *Euops falcatus* (Guérin-Méneville, 1833)], by original designation.

Subgenus *Kobusynaptops* Kôno

Kôno, 1927: 39 [key], 40 [description; *E. pustulosus* Sharp]; Dalla Torre & Voss 1930: 30, 33 [catalogue: *E. pustulosus* Sharp]; Hirano 1954: 1-2 [*E. pustulosus* Sharp]; Chûjô & Morimoto 1959: 146 [*E. pustulosus* Sharp]; Sawada & Morimoto 1985: 192, 193 [*E. pustulosus* Sharp]; Sawada 1986: 44 [*E. pustulosus* Sharp]; Morimoto 1992: 5 [*E. pustulosus* Sharp].

Type species: *Euops pustulosus* Sharp, by original designation.

Subgenus *Neosynaptops* Voss

Voss, 1930: 82-83 [proposal of subgenus name with descriptive comments; *E. singularis* Voss, *E. viridiceps* Voss, *E. viridiventris* Heller]; Dalla Torre & Voss 1953: 15 [catalogue: *E. viridiceps* Voss].

Type species: *Euops viridiceps* Voss, by present designation.

Subgenus *Ophthalmolabus* Jekel

Jekel, 1860: 222 [description; *E. goudotii* Jekel, *E. morio* Boheman (designation as type)]; Lacordaire 1863: 550 [redescription; *E. goudotii* Jekel, *E. morio* Boheman]; Gemminger & Harold 1871: 2482 [catalogue; no species indicated]; Voss 1924a: 33, 34, 38, 39, 42 [key to species: *E. distinctus* Voss, *E. goudoti* Jekel, *E. guineensis* Voss, *E. minutus* Voss, *E. monticolus* Voss, *E. semiviolaceus* Faust, *E. togoensis* Faust]; Hustache 1924: 558-560 [*E. alluaudi* Hustache, *E. goudoti* Jekel, *E. janthinus* Fairmaire, *E. longipes* Hustache, *E. luteicornis* Hustache, *E. ruginotus* Fairmaire]; Voss 1925: 292, 295 [key to species: Same as listed for Voss, 1924a]; Dalla Torre & Voss 1930: 30, 32-33 [catalogue: *E. aeneicollis* Voss, *E. alluaudi* Hustache, *E. cyaneus* Marshall, *E. distinctus* Voss, *E. goudoti* Jekel, *E. guineensis* Voss, *E. janthinus* Fairmaire, *E. longipes* Hustache, *E. luteicornis* Hustache, *E. monticolus* Voss, *E. morio* Boheman, *E. semiviolaceus* Faust, *E. togoensis* Faust]; Voss 1939a: 59 [*E. ilaegiae* Voss], 60-61 [*E. burgeoni* Voss, *E. schoutedeni* Voss], 62-63 [transfer of *E. cyaneus* Marshall and *E. togoensis* Faust to *Charops*]; Dalla Torre & Voss 1953: 13 [catalogue: *E. burgeoni* Voss, *E. ilaegiae* Voss, *E. schoutedeni* Voss (*E. cyaneus* Marshall and *E. togoensis* Faust to *Charops*)]; Voss 1962: 9 [*E. wittei* Voss].

Ophthalmoborus: Hustache 1955: 186 [*E. conicollis* Hustache].

Ophthalmolobus: Hustache 1955: 187 [*E. vadoni* Hustache].

Type species: *Euops morio* (Boheman), by original designation.

Subgenus *Suniops* Voss

Voss, 1928: 362 [footnote; proposal as nomen novum for *Synechops* Voss 1924 nec Marshall 1919; *E. blandus* Voss]; Voss 1929: 214 [reminder of change from *Synechops* to *Suniops*], 216 [key]; Dalla Torre & Voss, 1930: 30, 35-36 [catalogue: *E. aerosus* Pascoe, *E. anceps* Voss, *E. blandus* Voss, *E. boviei* Voss, *E. cyanellus* Voss, *E. dentatus* Voss, *E. elongatus* Voss, *E. gratiosus* Voss, *E. palawanus* Voss, *E. plicatus* Pascoe, *E. schultzei* Voss, *E. scutellaris* Voss, *E. semicupreus* Voss, *E. subopacus* Voss, *E. violaceus* Voss, *E. viridifuscus* Voss, *E. willemoesi* Baer]; Voss 1933b: 163-172 [*E. aerosus* Pascoe, *E. anceps* Voss, *E. apicalis* Voss, *E. blandus* Voss, *E. boviei* Voss, *E. cribrarius* Voss, *E. cupreus* Voss, *E. cupripennis* Voss, *E. cyanellus* Voss, *E. dentatus* Voss, *E. elongatus* Voss, *E. fuscocupreus* Voss, *E. gratiosus* Voss, *E. jucundus* Voss, *E. moseri* Voss, *E. palawanus* Voss, *E. parvulus* Voss, *E. plicatus* Pascoe, *E. rufitarsis* Voss, *E. schultzei* Voss, *E. scutellaris* Voss, *E. semicupreus* Voss, *E. turbaticollis* Voss, *E. violaceus* Pascoe, *E. viridifuscus* Voss, *E. viridulus* Voss, *E. willemoesi* Baer]; Voss 1935b: 122-123 [*E. mesosternalis* Voss, *E. semimetallicus* Voss, *E. gratiosus* Voss]; Voss 1935c: 518 [*E. subdentatus* Voss]; Voss 1937: 134 [*E. scutellaris* Voss]; Dalla Torre & Voss 1953: 15-16 [catalogue: *E. aerosus* Pascoe, *E. anceps* Voss, *E. apicalis* Voss, *E. blandus* Voss, *E. boviei* Voss, *E. cribrarius* Voss, *E. cupreus* Voss, *E. cupripennis* Voss, *E. cyanellus* Voss, *E. dentatus* Voss, *E. elongatus* Voss, *E. fuscocupreus* Voss, *E. gratiosus* Voss, *E. jucundus* Voss, *E. mesosternalis* Voss, *E. moseri* Voss, *E. palawanus* Voss, *E. parvulus* Voss, *E. plicatus* Pascoe, *E. rufitarsis* Voss, *E. schultzei* Voss, *E. scutellaris* Voss, *E. semicupreus* Voss, *E. semimetallicus* Voss, *E. subdentatus* Voss, *E. turbaticollis* Voss, *E. violaceus* Pascoe, *E. viridifuscus* Voss, *E. viridulus* Voss, *E. walshi* Voss, *E. willemoesi* Baer]; Voss 1956c: 420 [*E. cuprinus* Voss].

Synechops Voss [nec Marshal 1919] [no type species designated], 1924a: 38, 39, 44 [key to species: *E. anceps* Voss, *E. boviei* Voss, *E. cyanellus* Voss, *E. dentatus* Voss, *E. palawanus* Voss, *E. schultzei* Voss, *E. scutellaris* Voss, *E. semicupreus* Voss, *E. subopacus* Voss, *E. viridifuscus* Voss; *E. willemoesi* Baer]; Voss 1925: 293, 298 [key to species: *E. anceps* Voss, *E. boviei* Voss, *E. cyanellus* Voss, *E. dentatus* Voss, *E. elongatus* Voss, *E. gratiosus* Voss, *E. palawanus* Voss, *E. schultzei* Voss, *E. scutellaris* Voss, *E. semicupreus* Voss, *E. subopacus* Voss, *E. viridifuscus* Voss, *E. willemoesi* Baer]; Dalla Torre & Voss 1930: 30 [synonymy].

Type species: No type species designated.

Subgenus *Synaptops* Jekel

Jekel, 1860: 221 [description; *E. nietneri* Jekel (designation as type), *E. bowringii* Jekel, *E. bakewelli* Jekel], 222; Lacordaire 1863: 550 [redescription; *E. bakewelli* Jekel, *E. bowringii* Jekel, *E. nietneri* Jekel]; Gem-

minger & Harold 1871: 2482 [catalogue; no species indicated]; Roelofs 1876: 8 [*E. willemoesi* Baer]; Faust 1894: 164 [*E. fulgidus* Faust]; Voss 1924a: 33, 38, 39, 43 [key to species: *E. bakewelli* Jekel, *E. chinensis* Voss, *E. nietneri* Jekel, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. pustulosus* Sharp, *E. singularis* Voss, *E. splendens* Roelofs]; Voss 1924b: 278 [*E. indigenus* Voss]; Voss 1925: 293, 296 [key to species: *E. bakewelli* Jekel, *E. chinensis* Voss, *E. indigenus* Voss, *E. nietneri* Jekel, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. pustulosus* Sharp, *E. singularis* Voss, *E. splendens* Roelofs, *E. striatus* Voss]; Kôno 1927: 39 [key], 40-44 [*E. chinensis* Voss, *E. indigenus* Voss, *E. konoi* Sawada & Morimoto, *E. lespedezae* Sharp, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. splendens* Roelofs, *E. striatus* Voss]; Voss 1928: 362 [*E. peguensis* Voss]; Heller 1929: 112 [*E. viridiventris* Heller]; Voss 1935a: 96 [*E. andrewesi* Voss]; Dalla Torre & Voss 1930: 30, 34-35 [catalogue: *E. bakewelli* Jekel, *E. bowringii* Jekel, *E. chinensis* Voss, *E. indigenus* Voss, *E. lespedezae* Sharp, *E. nietneri* Jekel, *E. peguensis* Voss, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. singularis* Voss, *E. splendidus* DallaTorre & Voss, *E. striatus* Voss, *E. viridiventris* Heller]; Kôno 1930: 15 [*E. punctatostriatus* (Motschulsky)], 28 [*E. punctatostriatus* (Motschulsky), *E. lespedezae* Sharp]; Voss 1933a: 116 [*E. kharsu* Voss]; Voss 1935a: 96 [*E. andrewesi* Voss]; Voss 1941a: 247 [*E. chinensis* Voss]; Voss 1941b:118 [*E. lespedezae* Sharp]; Voss 1942: 101 [*E. chinensis* Voss], 102 [*E. cuprifulgens* Voss]; Voss 1945-48: 160 [*E. chinensis* Voss, *E. cuprifulgens* Voss]; Ter-Minassian 1950: 179-182 [redescription; *E. lespedezae* Sharp, *E. konoi* Sawada & Morimoto, *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss]; Dalla Torre & Voss 1953: 14-15 [catalogue: *E. chinensis* Voss, *E. cuprifulgens* Voss, *E. kharsu* Voss, *E. konoi* Sawada & Morimoto, *E. lespedezae* Sharp, *E. nietneri* Jekel, *E. peguensis* Voss, *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss, *E. suffundens* Walker]; Hirano 1954: 3-8 [*E. lespedezae* Sharp, *E. politus* Roelofs, *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss]; Voss 1957: 98 [*E. suffundens* Walker, *E. keiseri* Voss]; Voss 1958: 14 [key to species from Fukien], 15 [*E. cuprifulgens* Voss, *E. chinensis* Voss], Verbreitungsübersicht [distribution in oriental and palearctic region]; Chûjô & Morimoto 1959: 146-147 [key; *E. konoi* Sawada & Morimoto, *E. lespedezae* Sharp, *E. politus* Roelofs, *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss]; Sawada & Morimoto 1985: 182-192 [*E. chinensis* Voss, *E. clarus* Sawada & Morimoto, *E. indigenus* Voss, *E. konoi* Sawada & Morimoto, *E. lespedezae* Sharp, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss, *E. striatus* Voss]; Sawada 1986: 43-44 [*E. konoi* Sawada & Morimoto, *E. lespedezae* Sharp, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss]; Yoon & Bae 1986: 34 [*E. lespedezae* Sharp, *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss]; Morimoto 1992: 5 [*E. konoi* Sawada & Morimoto, *E. lespedezae* Sharp, *E. politus* (Roelofs), *E. punctatostriatus* (Motschulsky), *E. splendidus* Dalla Torre & Voss].

Type species: *Euops nietneri* Jekel 1860 [= *Euops suffundens* (Walker, 1859)], by original designation.

Catalogue of *Euops* species of the Australian region

affinis Voss — Australia (Queensland, New South Wales, Victoria)

Euops affinis Voss, 1924a: 40 [key], 46 [description; comparison with *E. eucalypti* Pascoe]; Voss 1925: 294 [key]; Dalla Torre & Voss 1930: 30 [catalogue]; Zimmerman 1992: pl. 328, fig 7, 8; Zimmerman 1994: 544 [catalogue].

armatipennis Voss — Papua New Guinea

Euops armatipennis Voss, 1924a: 41 [key], 51 [description]; Voss 1925: 295 [key]; Heller 1929: 111 [comparison with *E. vossi* Heller]; Dalla Torre & Voss 1930: 31 [catalogue].

bakewelli Jekel — Australia (New South Wales, Victoria)

Euops bakewelli Jekel, 1860: 221 [description]; Lacordaire 1863: 550 [catalogue]; Gemminger & Harold 1871: 2482 [catalogue]; Masters 1886: 658 [catalogue]; Lea 1898: 615 [key], 616 [descriptive note], 619 [comparison with *E. corrugatus* Lea]; Lea 1911: 194 [list]; Lea 1915: 453 [new record]; Voss 1924a: 44 [key], 57 [catalogue; comparison with *E. nietneri metallicus* Voss]; Voss 1925: 298 [key]; Dalla Torre & Voss 1930: 34 [catalogue]; Zimmerman 1991: pl. 56, fig. 3, 4; Zimmerman 1994: 544 [catalogue].

buergersi Voss Papua New Guinea

[emended according to article 32di2 of ICZN]

Euops bürgersi Voss, 1924a: 40 [key], 47 [description]; Voss 1925: 294 [key]; Dalla Torre & Voss 1930: 31 [catalogue].

clavigerus Pascoe Australia (Queensland)

Euops clavigera Pascoe, 1874: 28 [description]; Masters 1886: 658 [catalogue]; Lea 1898: 618 [comparison with *E. strigiventris* Lea]; Lea 1909a: 178 [comparison with *E. lateralis* Lea]; Voss 1924a: 41 [key], 48 [catalogue; new record]; Voss 1925: 294 [key]; Lea 1929: 543 [comparison with *E. coxalis* Lea]; Voss 1929: 215 [key]; Dalla Torre & Voss 1930: 31 [catalogue]; Zimmerman 1991: pl. 56, fig. 5, 6; Zimmerman 1994: 544 [catalogue].

coelestinus Pascoe Indonesia (Irian Jaya: New Guinea)

Euops coelestina Pascoe, 1874: 27 [description]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 36 [catalogue].
Euops celestina: Pascoe 1885: 232 [new record].

contactus Lea Australia (Queensland)

Euops contacta Lea, 1929: 543 [description; comparison with *E. eucalypti* Pascoe, *E. strigiventris* Lea]; Zimmerman 1991: pl. 56, fig. 7, 8; Zimmerman 1994: 545 [catalogue].

corrugatus Lea Australia (Queensland, New South Wales)

Euops corrugata Lea, 1898: 615 [key], 618 [description], 619 [comparison with *E. bakewelli* Jekel, *E. victoriensis* Blackburn]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Lea 1929: 540 [descriptive note; new record], 541 [comparison with *E. quadrifasciculatus* Lea]; Dalla Torre & Voss 1930: 36 [catalogue]; Zimmerman 1991: pl. 57, fig. 1, 2; Zimmerman 1994: 545 [catalogue].

coxalis Lea Australia (New South Wales)

Euops coxalis Lea, 1929: 542 [description], 543 [comparison with *E. clavigerus* Pascoe, *E. eucalypti* Pascoe, *E. strigiventris* Lea]; Zimmerman 1991: pl. 57, fig. 3, 4; Zimmerman 1994: 545 [catalogue].

cupreosplendens Macleay Papua New Guinea

Euops cupreosplendens W. J. Macleay, 1886: 186 [description]; Faust 1894: 164 [comparison with *E. fulgidus* Faust]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 31 [catalogue].

divisus Pascoe Indonesia (Maluku: Batchian; Irian Jaya: Mysol, New Guinea)

Euops divisa Pascoe, 1874: 29 [description], pl. 3, fig. 6; Voss 1924a: 40 [key], 48 [catalogue]; Voss 1925: 294 [key], pl. 1, fig. 5; Voss 1929: 214 [key]; Dalla Torre & Voss 1930: 31 [catalogue].

effulgens Lea Australia (South Australia)

Euops effulgens Lea, 1909a: 177 [description; comparison with *E. eucalypti* Pascoe]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 36 [catalogue]; Zimmerman 1991: pl. 57, fig. 5, 6; Zimmerman 1994: 545 [catalogue].

episternalis Lea Australia (Queensland)

Euops episternalis Lea, 1929: 542 [description; comparison with *E. postocularis* Lea n. n.]; Zimmerman 1991: pl. 57, fig. 7, 8; Zimmerman 1994: 545 [catalogue].

eucalypti Pascoe Australia (Queensland)

Euops eucalypti Pascoe, 1874: 28 [description], 29 [comparison with *E. divisa* Pascoe; host record]; Masters 1886: 658 [catalogue]; Lea 1898: 616 [descriptive note; key], 620 [comparison with *E. puncticollis* Lea]; Lea 1909a: 177 [comparison with *E. effulgens* Lea]; Lea 1915: 453 [new record]; Voss 1924a: 40 [key],

46 [catalogue, comparison with *E. suturalis* Lea, *E. affinis* Voss], 50 [comparison with *E. victoriensis* Blackburn]; Voss 1925: 294 [key]; Lea 1929: 540 [descriptive notes, new record], 543 [comparison with *E. coxalis* Lea, *E. contacta* Lea], 544 [comparison with *E. micans* Lea]; Dalla Torre & Voss 1930: 31 [catalogue]; Zimmerman 1991: pl. 58, fig. 1, 2; Zimmerman 1994: 545 [catalogue].

Euops eucalypti f. *castaneipennis* Voss, 1924a: 40 [key], 46 [description]; Voss 1925: 294 [key]; Dalla Torre & Voss 1930: 31 [catalogue]; Zimmerman 1994: 545 [catalogue].

Euops eucalypti f. *rubra* Voss, 1929: 214 [key, description]; Dalla Torre & Voss 1930: 31 [catalogue]; Zimmerman 1994: 545 [catalogue].

falcatus (Guérin-Méneville) Australia (New South Wales, Victoria)

Attelabus falcatus Guérin-Méneville 1833: pl. 36, fig. 4 [illustration/description]; Guérin-Méneville 1844: 137 [catalogue]; Schoenherr 1839: 310 [catalogue]; Lacordaire 1863: 550 [catalogue]; Zimmerman 1994: 547 [catalogue].

Euops falcatus Jekel 1860: 220 [comparison with *E. howittii* Jekel]; Lacordaire 1863: 550 [catalogue]; Zimmerman 1994: 547 [catalogue].

Euops falcata Gemminger & Harold 1871: 2482 [catalogue]; Masters 1886: 658 [catalogue]; Lea 1898: 615 [key], 616 [new records, variability], 617 [comparison with *E. victoriensis* Blackburn, *E. suturalis* Lea]; Lea 1909a: 176 [comparison with *E. rudis* Lea]; Lea 1909b: 198 [list]; Lea 1911: 194 [list]; Voss 1924a: 40 [key], 48 [catalogue], 63 [possible synonymy with *E. howittii* Jekel and *E. puncticollis* Boh.]; Voss 1925: 294 [key], 302 [possible synonymy with *E. howittii* Jekel, *E. puncticollis* Boh.]; Dalla Torre & Voss 1930: 31 [catalogue]; McAreavy 1938: 123 [behaviour; host record]; Moore 1961: 94 [host record]; Zimmerman 1991: pl. 58, fig. 3, 4; Zimmerman 1994: 546-550 [biology; catalogue; morphology], figs. 355-359.

australasiae (*Euops*) Fahraeus [nec Hope], in Schoenherr, 1839: 319 [=*Parablops australasiae* Schoenherr, same page, lapsus]; Jekel 1860: 220 [synonymy]; Lacordaire 1863: 550 [catalogue]; Gemminger & Harold 1871: 2482 [catalogue]; Masters 1886: 658 [catalogue]; Lea 1898: 616; Dalla Torre & Voss 1930: 31 [catalogue]; Zimmerman 1994: 547 [catalogue].

howittii (*Euops*) Jekel, 1860: 220 [description; comparison with *E. falcatus* (Guérin-Méneville)]; Lacordaire 1863: 550 [catalogue]; Zimmerman 1994: 547 [catalogue].

Euops howitti: Gemminger & Harold 1871: 2482 [catalogue]; Masters 1886: 658 [catalogue]; Lea 1898: 616 [synonymy]; Voss 1924a: 62 [catalogue], 63 [possible synonymy with *E. falcatus* (Guérin-Méneville), *E. puncticollis* Boh.]; Voss 1925: 301 [catalogue], 302 [possible synonymy with *E. falcatus* (Guérin-Méneville), *E. puncticollis* Boh.]; Dalla Torre & Voss 1930: 31 [catalogue].

puncticollis (*Euops*) Boheman, 1859: 117 [description]; Lacordaire 1863: 550 [catalogue]; Gemminger & Harold 1871: 2482 [catalogue]; Masters 1886: 658 [catalogue]; Lea 1898: 616 [synonymy]; Voss 1924a: 63 [catalogue; possible synonymy with *E. falcatus* (Guérin-Méneville), *E. howittii Jekel*]; Voss 1925: 302 [catalogue; possible synonymy with *E. falcatus* (Guérin-Méneville), *E. howittii Jekel*]; Voss 1942: 100 [comparison with *E. championi* Voss; valid species, different from *E. falcatus* (Guérin-Méneville)]; Zimmerman 1994: 547 [catalogue].

Euops falcata subsp. *puncticollis*: Dalla Torre & Voss 1930: 31 [catalogue].

femoralis femoralis Voss Papua New Guinea

Euops femoralis Voss, 1924a: 41 [key], 50 [description]; Voss 1925: 295 [key]; Voss 1929: 215 [key]; Dalla Torre & Voss 1930: 31 [catalogue]; Voss 1956b: 124 [comparison with *E. femoralis ruficornis* Voss].

femoralis ruficornis Voss Papua New Guinea

Euops femoralis f. *ruficornis* Voss, 1956b: 124 [description].

flavomaculatus Lea Australia (Qeensland)

Euops flavomaculata Lea, 1909a: 178 [description], 179 [comparison with *E. lateralis* Lea]; Voss 1924a: 40 [key], 46 [catalogue, comparison with *E. suturalis* Lea], 49 [comparison with *E. maculatus* Voss]; Voss 1925: 293 [key]; Dalla Torre & Voss 1930: 31 [catalogue]; Zimmerman 1991: pl. 58, fig. 5, 6; Zimmerman 1994: 552 [catalogue].

impuncticollis Lea — Australia (Queensland)

Euops impuncticollis Lea, 1909a: 178 [description]; Voss 1924a: 63 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 36 [catalogue]; Zimmerman 1991: pl. 58, fig. 7, 8; Zimmerman 1994: 552 [catalogue].

insularis Voss — Indonesia (Maluku: Aru, Kei)

Euops insularis Voss, 1933a: 115 [description], 116 [comparison with *E. niger* Voss]; Voss 1942: 101 [comparison with *E. nitidicollis* Voss]; Dalla Torre & Voss 1953: 13 [catalogue].

jekelii Pascoe — Indonesia (Irian Jaya: New Guinea, Salawatti, Waigeu; Maluku: Ambon, Aru), Papua New Guinea

Euops jekelii Pascoe, 1874: 29 [description]; Pascoe 1885: 232 [new records]; Sawada 1992: 83 [illustrations].

Euops jekeli: Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue].

lateralis Lea — Australia (Queensland)

Euops lateralis Lea, 1909a: 177 [description], 178 [comparison with *E. clavigera* Lea], 179 [comparison with *E. flavomaculatus* Lea]; Voss 1924a: 63 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue]; Zimmerman 1994: 552 [catalogue].

leai Voss — Australia (Queensland, New South Wales, Northern Territory)

Euops leai Voss, 1922b: 174 [new name for *E. puncticollis* Lea]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue]; Zimmerman 1991: pl. 59, fig. 1, 2; Zimmerman 1994: 552 [catalogue].

puncticollis (*Euops*) Lea [nec Boheman 1859], 1898: 616 [key], 619 [description], 620 [comparison with *E. corrugatus* Lea, *E. eucalypti* Pascoe]; Zimmerman 1994: 552 [catalogue, designation of lectotype].

spissus (*Euops*) Lea, 1929: 540 [new name for *E. puncticollis* Lea; new record, descriptive note]; Zimmerman 1994: 552 [catalogue].

maculatus Voss — Indonesia (Irian Jaya: Mysol)

Euops maculata Voss, 1924a: 41 [key], 48 [description], 49 [comparison with *E. flavomaculatus* Lea, *E. mysolensis* Voss]; Voss 1925: 294 [key]; Dalla Torre & Voss 1930: 32 [catalogue]; Voss 1933a: 116 [comparison with *E. sandakanensis* Voss]; Marshall 1953: 91 [comparison with *barbieri* Marshall].

micans Lea — Australia (Queensland)

Euops micans Lea, 1929: 543 [description], 544 [comparison with *E. eucalypti* Pascoe]; Zimmerman 1991: pl. 59, fig. 3, 4; Zimmerman 1994: 553 [catalogue].

montanus Voss — Australia (Queensland)

Euops montana Voss, 1924a: 41 [key], 50 [description; comparison with *E. strigiventris* Lea]; Voss 1925: 295 [key]; Dalla Torre & Voss 1930: 32 [catalogue]; Zimmerman 1994: 544 [type locality], 553 [catalogue].

mysolensis Voss — Indonesia (Irian Jaya: Mysol)

Euops mysolensis Voss, 1924a: 41 [key], 49 [description; comparison with *E. maculatus* Voss]; Voss 1925: 295 [key]; Dalla Torre & Voss 1930: 32 [catalogue].

niger Voss — Australia (Queensland)

Euops nigra Voss, 1929: 215 [key], 218 [description]; Dalla Torre & Voss 1930: 32 [catalogue]; Zimmerman 1994: 553 [catalogue].

papua Heller — Indonesia (Irian Jaya: New Guinea)

Euops papua Heller, 1914: 653 [description]; Voss 1924a: 41 [key], 51 [catalogue; comparison with *E. wallacei* Sharp]; Voss 1925: 295 [key]; Dalla Torre & Voss 1930: 32 [catalogue].

parvoarmatus Lea — Australia (Queensland)

Euops parvoarmata Lea, 1929: 541 [description]; Zimmerman 1994: 553 [catalogue].

picipes Voss — Indonesia (Irian Jaya: Mysol)

Euops picipes Voss, 1929: 215 [key], 219 [description]; Dalla Torre & Voss 1930: 32 [catalogue].

pulchellus Pascoe — Australia (Queensland)

Euops pulchella Pascoe, 1875: 61 [description]; Masters 1886: 658 [catalogue]; Lea 1898: 618 [comparison with *E. suturalis* Lea]; Lea 1909a: 176 [possible synonymy with *E. suturalis* Lea]; Voss 1924a: 63 [catalogue; possible synonymy with *E. suturalis* Lea]; Voss 1925: 302 [catalogue; possible synonymy with *E. suturalis* Lea]; Dalla Torre & Voss 1930: 32 [catalogue]; Zimmerman 1994: 553 [catalogue].

quadrifasciculatus Lea — Australia (Queensland)

Euops quadrifasculata Lea, 1929: 541 [description; comparison with *E. corrugatus* Lea]; Zimmerman 1991: pl. 59, fig. 7, 8; Zimmerman 1994: 553 [catalogue].

rudis Lea — Australia (New South Wales)

Euops rudis Lea, 1909a: 176 [description; comparison with *E. falcatus* (Guérin-Méneville)]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue]; Zimmerman 1991: pl. 60, fig. 1, 2; Zimmerman 1994: 554 [catalogue; designation of lectotype].

singularis Voss — Papua New Guinea

Euops singularis Voss, 1924a: 44 [key], 57 [description]; Voss 1925: 298 [key]; Heller 1929: 112 [comparison with *E. viridiventris* Heller]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1930: 83 [comparison with *E. viridiventris* Heller, *E. viridiceps* Voss].

strigiventris Lea — Australia (Queensland, New South Wales)

Euops strigiventris Lea, 1898: 615 [key], 618 [description; comparison with *E. clavigerus* Pascoe, *E. trigemmatus* Pascoe]; Lea 1911: 194 [description of male; new records; variation]; Voss 1924a: 41 [key], 50 [catalogue; descriptive note]; Voss 1925: 295 [key]; Lea 1929: 540 [new record; descriptive note], 543 [comparison with *E. coxalis* Lea, *E. contactus* Lea]; Dalla Torre & Voss 1930: 32 [catalogue]; Voss 1939b: 451, fig. 7; Dalla Torre & Voss 1953: 13 [catalogue]; Zimmerman 1991: pl. 60, fig. 3, 4; Zimmerman 1994: 554 [catalogue].

subdentatus Voss — Indonesia (Maluku: Larat Is.)

Euops subdentata Voss, 1935c: 518 [description; comparison with *aerosus* Pascoe]; Dalla Torre & Voss 1953: 16 [catalogue; unjustified record for Birma].

suturalis Lea — Australia (Queensland, New South Wales)

Euops suturalis Lea, 1898: 616 [key], 617 [description; comparison with *E. falcatus* (Guérin-Méneville)], 618 [comparison with *E. suturalis* Lea, *E. victoriensis* Lea]; Lea 1909a:175 [notes on variation; host record]; Lea 1909b: 198 [new record]; Voss 1924a: 40 [key], 46 [catalogue; comparison with *E. eucalypti* Pascoe, *E. affinis* Voss], 63 [possible synonymy with *E. pulchellus* Pascoe]; Voss 1925: 293 [key], 302 [possible synonymy with *E. pulchella* Pascoe]; Lea 1929: 540 [new record; descriptive note]; Dalla Torre & Voss 1930: 32 [catalogue]; Zimmerman 1991: pl. 60, fig. 5, 6; Zimmerman 1994: 554 [catalogue].

testaceus Voss — Indonesia (Irian Jaya: Mysol), Papua New Guinea

Euops testacea Voss, 1929: 214 [key], 218 [description]; Voss 1956b: 124 [new record].

tibialis Voss — Indonesia (Irian Jaya: Mysol)

Euops tibialis Voss, 1929: 215 [key], 220 [description]; Dalla Torre & Voss 1930: 32 [catalogue].

trigemmatus Pascoe — Indonesia (Maluku: Batchian; Irian Jaya), Australia? (Queensland?)

Euops trigemmata Pascoe, 1874: 28 [description]; Lea 1898: 618 [comparison with *E. strigiventris* Lea]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue]; Zimmerman 1994: 554 [catalogue; discussion on validity of record for Australia].
Euops trigeminata: Pascoe 1885: 233 [new record]; Masters 1886: 658 [catalogue]; Zimmerman, 1994: 554 [catalogue].

tuberculatus Lea — Australia (Queensland)

Euops tuberculatus Lea, 1921: 220; Dalla Torre & Voss 1930: 37 [catalogue].

Euops tuberculata: Lea 1929: 541 [comparison with *E. parvoarmatus* Lea]; Zimmerman 1991: pl. 60, fig. 7, 8; Zimmerman 1994: 554 [catalogue].

victoriensis Blackburn — Australia (New South Wales, Victoria)

Euops victoriensis Blackburn, 1894: 285 [description]; Lea 1898: 616 [key], 617 [new record; comparison with *E. falcatus* (Guérin-Méneville)], 618 [comparison with *E. suturalis* Lea], 619 [comparison with *E. corrugatus* Lea]; Lea 1915: 453 [new record]; Voss 1924a: 41 [key], 50 [catalogue; comparison with *E. eucalypti* Pascoe]; Voss 1925: 295 [key]; Dalla Torre & Voss, 1930: 32 [catalogue]; Zimmerman 1991: pl. 61, fig. 1, 2; Zimmerman 1994: 554 [catalogue].

viridiceps Voss — Papua New Guinea

Euops viridiceps Voss, 1930: 82 [description], 83 [comparison with *E. singularis* Voss, *E. viridiventris* Heller]; Dalla Torre & Voss 1953: 15 [catalogue].

wallacei Sharp — Papua New Guinea

Euops wallacei Sharp, 1889: 55 (footnote) [description]; Voss 1924a: 41 [key], 51 [catalogue; comparison with *E. strigiventris* Lea, *E. papua* Voss]; Voss 1925: 295 [key]; Dalla Torre & Voss 1930: 32 [catalogue]; Voss 1956b: 125 [new record].

Catalogue of *Euops* species of the Ethiopian region

aeneicollis Voss — Tanzania

Euops aeneicollis Voss, 1929: 215 [key], 220 [description]; Dalla Torre & Voss 1930: 32 [catalogue]; Voss 1962: 10 [comparison with *E. wittei* Voss].

burgeoni Voss — Zaire

Euops burgeoni Voss, 1939a: 60 [key/description]; Dalla Torre & Voss 1953: 13 [catalogue].

cyaneus Marshall — Malawi, Republic South Africa, Zaire

Euops cyaneus Marshall, 1906: 943 [description]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 32 [catalogue]; Dalla Torre & Voss 1953: 13 [catalogue].

Euops cyanea: Voss 1939a: 61, 62 [key, new record]; Dalla Torre & Voss 1953: 13 [catalogue; new record].

guineensis Voss — Equatorial Guinea, Guinea, Cameroun

Euops guineensis Voss, 1922a: 166 [description]; Voss 1924a: 42 [key], 53 [catalogue, correction to description; new record]; Voss 1925: 296 [key]; Voss 1929: 215 [key]; Dalla Torre & Voss 1930: 33 [catalogue]; Voss 1939a: 59 [comparison with *E. ilaegiae*].

Euops guineaensis: Voss 1956d: 605 [new records].

ilaegiae Voss — Tanzania, Zaire

Euops ilaegiae Voss, 1939a: 59 [description; host record]; Dalla Torre & Voss 1953: 13 [catalogue].

monticolus monticolus Voss — Tanzania

Euops monticola Voss, 1924a: 42 [key], 53 [description; altitudinal distribution]; Voss 1925: 296 [key]; Voss 1929: 216 [key]; Dalla Torre & Voss 1930: 33 [catalogue]; Voss 1939a: 59 [comparison with *E. ilaegiae*]; Voss 1962: 10 [comparison with *E. wittei* Voss].

monticolus hildebrandti Voss — Kenya

Euops monticola f. *hildebrandti* Voss, 1924a: 53 [description]; Voss 1925: 296 [key]; Voss 1939a: 59 [comparison with *E. ilaegiae*].

Euops monticola subsp. *hildebrandti*: Voss 1924a: 42 [key]; Dalla Torre & Voss 1930: 33 [catalogue];

morio (Boheman) — Republic South Africa, Tanzania

Attelabus morio Boheman [nec Schoenherr] in: Schoenherr, 1845: 361 [description]; Lacordaire 1863: 550 [catalogue]; Jekel 1860: 222 [designation as type species for *Ophthalmolabus*]; Gemminger & Harold 1871: 2482 [catalogue]; Faust 1895: 234 [comparison with *E. togoensis* Faust]; Marshall 1906: 944 [comparison with *E. cyaneus* Mshl.]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Voss 1929: 215 [key], 221 [redescription]; Dalla Torre & Voss 1930: 33 [catalogue].

parilis Voss — Guinea

Euops parilis Voss, 1956d: 605 [description].

schoutedeni Voss — Zaire

Euops schoutedeni Voss, 1939a: 61 [key/description]; Dalla Torre & Voss 1953: 13 [catalogue].

semiviolaceus Faust — Ghana

Euops semiviolaceus Faust, 1895: 234 [description]; Dalla Torre & Voss 1930: 33 [catalogue].

Euops semiviolacea: Marshall 1906: 944 [comparison with *E. cyaneus* Mshl.]; Voss 1924a: 42 [key] 54 [catalogue; comparison with *E. goudoti* Jekel]; Voss 1925: 296 [key].

togoensis togoensis Faust — Togo, Kamerun

Euops togoensis Faust, 1895: 234 [description]; Voss 1924a: 42 [key], 52 [catalogue; comparison with *E. borneoensis* Voss; new records]; Voss 1925: 296 [key]; Dalla Torre & Voss 1930: 33 [catalogue]; Voss 1939a: 63 [key]; Dalla Torre & Voss 1953: 13, 14 [catalogue]; Voss 1956a: 1142 [new record].

togoensis spondiae Voss — Nigeria

togoensis ssp. *spondiae* Voss, 1939a: 63 [key/description; host record]; Dalla Torre & Voss 1953: 14 [catalogue].

wittei Voss — Uganda

Euops wittei Voss, 1962: 9 [description; comparison with *E. aeneicollis* Voss, *E. monticolus* Voss].

Catalogue of *Euops* species of the Madagasy region

alluaudi Hustache — Madagascar

Euops alluaudi Hustache, 1922: 418 [description; comparison with *E. longipes* Hustache]; Hustache 1924: 559 [key], 560 [redescription]; Dalla Torre & Voss 1930: 32 [catalogue].

conicollis Hustache — Madagascar

Europs [sic] *conicollis* Hustache, 1955: 186 [description].

convexicollis Richard   Comoro Is.

Euops convexicollis Richard, 1958: 63 [description].

distinctus Voss   Madagascar

Euops distincta Voss, 1924a: 42 [key], 54 [description]; Voss 1925: 296 [key]; Dalla Torre & Voss 1930: 33 [catalogue].

goudotii goudotii Jekel   Madagascar, Comoro Is. [?]

Euops goudotii Jekel, 1860: 222 [description]; Lacordaire 1863: 550 [catalogue].

Euops goudoti: Gemminger & Harold 1871: 2482 [catalogue]; Faust 1895: 234 [comparison with *E. togoensis* Faust]; Hustache 1924: 558 [key], 559 [catalogue; new records]; Voss 1924a: 42 [key] 53 [catalogue]; Voss 1925: 296 [key]; Dalla Torre & Voss 1930: 33 [catalogue].

minuta (*Euops*) Voss, 1924a: 42 [key], 54 [description; comparison with *E. goudotii* Jekel]; Voss 1925: 296 [key]; Dalla Torre & Voss 1930: 33 [catalogue]; Hustache 1955: 186 [synonymy].

coquerellii (*Attelabus*) Fairmaire, 1871: 44; Voss 1925: 302 [quotation of original description].
Euops coquereli: Dalla Torre & Voss 1930: 33 [catalogue, synonymy].

goudotii latirostris Richard   Comoro Is.

Euops goudoti ssp. *latirostris* Richard, 1958: 63 [description].

janthinus Fairmaire   Madagascar, Comoro Is.

Euops janthinus Fairmaire, 1899a: 545 [description]; Hustache 1924: 559 [catalogue; key; new records]; Voss 1925: 301 [catalogue]; Dalla Torre & Voss 1930: 33 [catalogue]; Richard 1958: 63 [new records].

longipes Hustache   Madagascar

Euops longipes Hustache, 1922: 418 [description]; Hustache 1924: 559 [key; redescription]; Dalla Torre & Voss 1930: 33 [catalogue].

luteicornis Hustache   Madagascar

Euops luteicornis Hustache, 1922: 418 [description]; Hustache 1924: 559 [key], 560 [redescription]; Dalla Torre & Voss 1930: 33 [catalogue].

ruginotus (Fairmaire)   Madagascar

Attelabus ruginotus Fairmaire, 1899b: 500 [description].
Euops ruginotus: Hustache 1924: 558 [key], 559 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue].

vadoni Hustache   Madagascar

Euops vadoni Hustache, 1955: 187 [description].

Catalogue of *Euops* species of the Oriental region (except Wallacea)

aerosus Pascoe   Indonesia (Maluku: Batchian, Sula), Malaysia (Sarawak)

Euops aerosa Pascoe, 1874: 28 [description; comparison with *E. plicatus* Pascoe]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Voss 1929: 217 [key], 222 [redescription], 223 [comparison with *E. willemoesi* Baer]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1933b: 168 [key]; Voss 1935c: 519 [comparison with *E. subdentatus* Voss]; Dalla Torre & Voss 1953: 15 [catalogue].

amethystinus Pascoe   Malaysia (Melaka, Sarawak, Sabah), Singapore

Euops amethystina Pascoe, 1874: 29 [description]; Voss 1924a: 39 [key], 46 [catalogue; descriptive note; new records]; Voss 1925: 293 [key]; Dalla Torre & Voss 1930: 30 [catalogue].

anceps Voss — Malaysia (Sabah), Philippines (Mindanao, Palawan)

Euops anceps Voss, 1924a: 44 [key], 58 [description]; Voss 1925: 298 [key]; Voss 1929: 216 [key]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1933b: 171 [key].

andrewesi Voss — India (Kerala)

Euops andrewesi Voss, 1935a: 96 [description], [comparison with *E. apicalis* Voss]; Dalla Torre & Voss 1953: 13 [catalogue].

armipes Voss — India (Uttar Pradesh)

Euops armipes Voss, 1933a: 117 [description]; Dalla Torre & Voss 1953: 13 [catalogue].

barbieri Marshall — Vietnam

Euops barbieri Marshall, 1953: 91 [description, comparison with *E. maculatus* Voss].

blandus Voss — Vietnam

Euops blanda Voss, 1928: 362 [description], 363 [comparison with *E. subopacus* Voss]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1933b: 166 [key]; Dalla Torre & Voss 1953: 15 [catalogue].

borneoensis Voss — Malaysia (Sabah)

Euops borneoensis Voss, 1924a: 41 [key], 49 [description], 52 [comparison with *E. togoensis* Faust]; Voss 1925: 295 [key]; Dalla Torre & Voss 1930: 31 [catalogue]; Voss 1942: 101 [comparison with *E. nitidicollis* Voss].

bowringii Jekel — "India Orientalis"

Euops bowringii Jekel, 1860: 221 [description]; Lacordaire 1863: 550 [catalogue]; Dalla Torre & Voss 1930: 34 [catalogue].

Euops bowringi: Gemminger & Harold 1871: 2482 [catalogue]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue].

championi Voss — India (Uttar Pradesh), Birma, China (Fujian, Guangxi, Guizhou, Hainan), Taiwan

Euops championi Voss, 1929: 214 [key], 217 [description]; Dalla Torre & Voss 1930: 31 [catalogue]; Voss 1942: 100 [new records; comparison with *E. falcata* (Guérin-Méneville)]; Voss 1945-48: 160 [new record]; Marshall 1948: 412 [new record]; Dalla Torre & Voss 1953: 13 [catalogue]; Voss 1958: 14 [key], 15 [new record]; Sawada & Morimoto 1985: 182 [redescription; new record], figs. 19, 25, 40; Liang et al. 1992: 404 [new record]; Morimoto 1992: 4 [key]; Zhang 1993: 396 [redescription; new record].

chinensis Voss — China (Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Zhejiang), Taiwan

Euops chinensis Voss, 1922a: 166 [description]; Voss 1924a: 43 [key], 55 [catalogue, new records]; Voss 1924b: 279 [descriptive comments; new record]; Voss 1925: 297 [key]; Kôno 1927: 39 [key], 41 [catalogue; records]; Dalla Torre & Voss 1930: 34 [catalogue]; Voss 1939c: 615 [new record]; Voss 1941a: 247 [new records]; Voss 1942: 101 [new record]; Voss 1945-48: 160 [new record]; Dalla Torre & Voss 1953: 14 [catalogue]; Voss 1958: 14 [key], 15 [new record]; Sawada & Morimoto 1985: 179 [key], 190 [description], figs. 22, 34, 42; Chen et al. 1992: 618 [redescription; new record]; Liang et al. 1992: 404 [new record]; Morimoto 1992: 4 [key]; Zhang 1993: 397 [redescription; new record].

Euops chinensis f. *purpurea* Kôno, 1927: 39 [key], 42 [description]; Dalla Torre & Voss 1930: 34 [catalogue]; Voss 1958: 14 [key], 15 [new record]; Sawada & Morimoto 1985: 190 [catalogue]; Morimoto 1992: 4 [key].

clarus Sawada & Morimoto — Taiwan

Euops clarus Sawada & Morimoto, 1985: 180 [key], 188 [description], figs. 4, 6, 21, 29, 38; Morimoto 1992: 5 [key].

cuprifulgens Voss — China (Fujian)

Euops cuprifulgens Voss, 1942: 102 [description]; Voss 1945-48: 160 [new record]; Dalla Torre & Voss 1953: 14 [catalogue]; Voss 1958: 14 [key], 15 [new record].

fulgidus Faust — Birma, Indonesia (Sumatra), Singapore

Euops fulgidus Faust, 1894: 164 [description; comparison with *E. cupreosplendens* Macleay].

Euops fulgida Voss 1924a: 40 [key], 48 [catalogue; new record]; Heller 1925: 222 [new record]; Voss 1925: 294 [key]; Dalla Torre & Voss 1930: 32 [catalogue]; Marshall 1931: 264 [comparison with *E. gardneri* Marshall]; Voss 1933a: 115 [comparison with *E. tonkinensis* Voss]; Voss 1955: 273 [comparison with *E. gardneri* Voss].

gardneri Marshall — India (Darjeeling)

Euops gardneri Marshall, 1931: 263 [description; host record]; Voss 1933a: 115 [comparison with *E. tonkinensis* Voss]; Voss 1935c: 518 [comparison with *E. ignitus* Voss]; Dalla Torre & Voss 1953: 13 [catalogue]; Voss 1955: 273 [comparison with *E. ignitus* Voss, *E. fulgidus* Faust and *E. tonkinensis* Voss].

gratiosus Voss — Indonesia (Sumatra, Java)

Euops gratiosa Voss, 1925: 298 [key], 300 [description]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 166 [key]; Voss 1935b: 123 [new records]; Dalla Torre & Voss 1953: 15 [catalogue].

ignitus Voss — Birma

Euops ignita Voss, 1935c: 518 [description; comparison with *E. gardneri* Marshall, *E. tonkinensis* Voss]; Voss 1933a: 114 [comparison with *E. tonkinensis* Voss]; Dalla Torre & Voss 1953: 13 [catalogue]; Voss 1955: 273 [comparison with *E. gardneri* Voss].

indigenus Voss — Taiwan

Euops indigenus: Sawada & Morimoto, 1985: 181 [key], 183 [redescription], figs. 12, 14, 20, 26, 41; Morimoto 1992: 5 [key].

Euops indigena: Voss 1924b: 278 [description]; Voss 1925: 297 [key]; Kôno 1927: 40 [key], 43 [catalogue; descriptive note]; Dalla Torre & Voss 1930: 34 [catalogue]; Sawada & Morimoto 1985: 183 [catalogue].

matsumurana (*Euops*) Kôno, 1927: 39 [key], 42 [description]; Dalla Torre & Voss 1930: 34 [catalogue]; Sawada & Morimoto 1985: 183 [catalogue; synonymy]; Morimoto 1992: 5 [key].

javanicus Voss — Indonesia (Java)

Euops javanica Voss, 1935b: 121 [description], 122 [comparison with *E. sandakanensis* Voss]; Dalla Torre & Voss 1953: 13 [catalogue].

keiseri Voss — Sri Lanka

Euops keiseri Voss, 1957: 98 [description], 99 [comparison with E. politus].

kharsu Voss — India (Uttar Pradesh)

Euops kharsu Voss, 1933a: 116 [description], 117 [host record]; Dalla Torre & Voss 1953: 14 [catalogue].

mesosternalis Voss — Indonesia (Java)

Euops mesosternalis Voss, 1935b: 122 [description]; Dalla Torre & Voss 1953: 16 [catalogue].

nigricollis Marshall — Birma

Euops nigricollis Marshall, 1948: 412 [description; comparison with *E. punctatostriatus* (Motschulsky)]; Dalla Torre & Voss 1953: 13 [catalogue].

nitidicollis Voss — China (Fujian)

Euops nitidicollis Voss, 1942: 101 [description; comparison with *E. borneoensis* Voss, *E. insularis* Voss]; Dalla Torre & Voss 1953: 13 [catalogue]; Voss 1958: 14 [key], 15 [new record].

paradoxus Voss — Birma (Tenasserim, Mergui)

Euops paradoxa Voss, 1935a: 97 [description]; Dalla Torre & Voss 1953: 14 [catalogue].

peguensis Voss — Birma

Euops peguensis Voss, 1928: 362 [description]; Dalla Torre & Voss 1930: 34 [catalogue]; Marshall 1948: 412 [new record]; Dalla Torre & Voss 1953: 14 [catalogue].

sandakanensis Voss — Malaysia (Sabah)

Euops sandakanensis Voss, 1933a: 116 [description; comparison with *E. maculatus* Voss]; Voss 1935b:122 [comparison with *javanicus* Voss]; Dalla Torre & Voss 1953: 13 [catalogue].

scutellaris scutellaris Voss — Indonesia (Sumatra, Java), Malaysia (Penang, Sabah)

Euops scutellaris Voss, 1924a: 44 [key], 58 [description]; Voss 1925: 298 [key]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 171 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

scutellaris igniceps Voss — Indonesia (Java)

Euops scutellaris f. *igniceps* Voss, 1937: 134 [description]; Dalla Torre & Voss 1953: 16 [catalogue].

semimetallicus Voss: Indonesia (Java)

Euops semimetallica Voss, 1935b: 122 [description]; Dalla Torre & Voss 1953: 16 [catalogue].

striatus Voss — Taiwan

Euops striata Voss, 1924b: 279 [description]; Voss 1925: 297 [key]; Kôno 1927: 39 [key], 40 [catalogue]; Dalla Torre & Voss 1930: 35 [catalogue].

Euops striatus: Sawada & Morimoto 1985: 179 [key], 192 [redescription], figs. 23, 35, 43; Morimoto 1992: 4 [key].

submetallicus Voss — India (Bihar)

Euops submetallica Voss, 1935a: 98 [description]; Dalla Torre & Voss 1953: 14 [catalogue].

suffundens (Walker) — Sri Lanka

Rhynchites suffundens Walker, 1859: 263 [description]; Gemminger & Harold 1871: 2487 [catalogue]; Voss 1939d: 88 [catalogue].

Euops suffundens: Marshall 1930: 575 [new combination]; Voss 1942: 103 [comparison with *E. cuprifulgens* Voss]; Dalla Torre & Voss 1953: 15 [catalogue].

nietneri (*Euops*) Jekel, 1860: 221 [designation as type species for *Synaptops* Jekel], 222 [description], pl. 3, fig. 10; Lacordaire 1863: 550 [catalogue]; Gemminger & Harold 1871: 2482 [catalogue]; Voss 1924a: 43 [key], 56 [catalogue; descriptive note]; Voss 1925: 298 [key]; Marshall 1930: 575 [synonymy]; Dalla Torre & Voss 1930: 34 [catalogue]; Dalla Torre & Voss 1953: 14, 15 [catalogue]; Voss 1957: 98 [descriptive note; new record].

Euops nietneri f. *metallica* Voss, 1924a: 43 [key], 56 [description]; Voss 1925: 298 [key]; Dalla Torre & Voss 1930: 34 [catalogue]; Dalla Torre & Voss 1953: 15 [catalogue]; Voss 1957: 98 [new record].

tonkinensis Voss — Vietnam

Euops tonkinensis Voss, 1933a: 114 [description]; Voss 1935c: 518 [comparison with *ignitus* Voss]; Dalla Torre & Voss 1953: 13 [catalogue]; Voss 1955: 273 [comparison with *E. gardneri* Voss].

viridicollis Voss — India (Sikkim)

Euops viridicollis Voss, 1924a: 64 [description]; Voss 1925: 295 [key]; Dalla Torre & Voss 1930: 32 [catalogue].

walshi Voss — Indonesia (Java)

Euops walshi Voss, 1937: 134 [description]; Dalla Torre & Voss 1953: 16 [catalogue].

Catalogue of *Euops* species of the Palearctic region

konoi Sawada & Morimoto — Japan

Euops konoi Sawada & Morimoto, 1985: 181 [key], 185 [description], figs. 3, 5, 11, 28, 36, 37; Sawada & Morimoto 1986: 197, 205, figs. 17, 19 [biology; morphology]; Sawada 1986: 44 [distribution; host records].

Euops phaedonia: Kôno [nec. Sharp] 1927: 40 [key], 43 [comparison with *punctatostriatus* (Motsch.)]; Kôno 1930: 28 [host record]; Kôno 1950: 1284; Ter-Minassian 1950: 179 [key; redescription]; Dalla Torre & Voss 1953: 14 [catalogue]; Chûjô & Morimoto 1959: 147 [key]; Matoba 1975: 19 [key], 20 [diagnosis]; Hayashi et al. 1984: 259, pl. 51, fig. 10; Sawada & Morimoto 1985: 185 [catalogue]; Morimoto 1992: 5 [key].

lespedezae lespedezae Sharp — Japan

Euops lespedezae Sharp, 1889: 55 [description], 56 [host record]; Faust 1895: 234 [comparison with *E. togoensis* Faust]; Schilsky 1903: p. X [catalogue]; Jacobson 1904: p. XXXV [new records]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Kôno 1927: 40 [comparison with *E. splendidus* Voss]; Dalla Torre & Voss 1930: 34 [catalogue]; Kôno 1930: 28 [host record]; Kôno & Kim 1937: 10; Kôno 1950: 1285; Dalla Torre & Voss 1953: 14 [catalogue]; Hirano 1954: 6-7 [comparison with *E. splendidus* Voss]; Cho 1957: 101; Chûjô & Morimoto 1959: 147 [key]; Nakane et al. 1963: 335, pl. 178; Matoba 1975: 19 [diagnosis; key]; Hayashi et al. 1984: 259, pl. 51, fig. 7; Sawada & Morimoto 1985: 179 [key], 190 [redescription], figs. 10, 30; Sawada 1986: 44 [distribution; host records]; Sawada & Morimoto 1986: 197, 205 [biology; morphology]; Yoon & Bae 1986: 35 [catalogue; diagnosis]; Morimoto 1992: 5 [key].

Attelabrus lespedezae: Lewis 1879: 22 [catalogue, with imprecise reference to Roelofs].

Attelabus lespedezae: Kôno 1927: 40 [catalogue]; Hirano 1954: 6 [catalogue]; Yoon & Bae 1986: 35 [catalogue].

Attelabus (*Euops*) *lespedezae*: Schönfeldt 1891: 264 [catalogue].

Cyphus lespedezae: Schönfeldt 1887:147 [catalogue].

Euops punctatostriatus: Djukin 1915: 411 [biology].

Euops splendens Var. b Schilsky 1903: 61 [redescription]; Sawada & Morimoto 1985: 190 [catalogue].

Euops splendens f. *unicolorata* Voss 1924a: 43 [key], 56 [description]; Voss 1925: 297 [key]; Kôno 1927: 39 [key], 41 [catalogue; new record]; Dalla Torre & Voss 1930: 35 [catalogue]; Hirano 1954: 6 [catalogue]; Matoba 1975: 20 [catalogue]; Sawada & Morimoto 1985: 190 [catalogue]; Yoon & Bae 1986: 34 [catalogue].

Euops splendida f. *unicolorata*: Yuasa & Kôno 1950: 1285 [comment in Japanese]; Dalla Torre & Voss 1930: 35 [catalogue]; Iga 1955: 143, pl. 51; Sawada & Morimoto 1985: 190 [catalogue].

lespedezae koreanus Voss — Japan (Tsushima), Korea, China (Kirin), Russia (Primorskii)

Euops lespedezae koreanus: Sawada & Morimoto, 1985: 180 [key], 191 [redescription], figs. 32, 39; Sawada & Morimoto 1986: 197, figs.13-14 [biology; morphology]; Morimoto 1992: 5 [key].

Euops splendens f. *koreana* Voss 1924a: 43 [key], 56 [description]; Voss 1925: 297 [key]; Kôno 1927: 39 [key], 41 [catalogue]; Dalla Torre & Voss 1930: 35 [catalogue]; Hirano 1954: 6 [catalogue]; Matoba 1975: 20 [catalogue]; Yoon & Bae 1986: 34 [catalogue].

Euops lespedezae: Ter-Minassian 1950: 179 [key], 182 [redescription]; Sawada & Morimoto 1985: 191 [catalogue].

? *Euops lespedezae f. cuprinipennis* Voss 1941b: 118 [description]; Voss 1942: 103 [comparison with *E. cuprifulgens* Voss]; Dalla Torre & Voss 1953: 14 [catalogue]; Sawada & Morimoto 1985: 191 [discussion of status].

politus (Roelofs) Japan

Attelabus politus Roelofs, 1874: 140 [description]; Schilsky 1906: 93 [catalogue]; Kôno 1927: 44 [catalogue]; Hirano 1954: 3 [catalogue]; Sawada & Morimoto 1985: 184 [catalogue].

Attelabrus politus: Lewis 1879: 22 [catalogue].

Attelabus (*Euops*) *politus*: Schönfeldt 1891: 264 [catalogue].

Cyphus politus: Schönfeldt 1887:146 [catalogue].

Euops politus: Sharp 1889: 56 [redescriptive notes]; Schilsky 1903: p. X [catalogue]; Schilsky 1906: 93 [redescription]; Kôno 1927: 44 [catalogue]; Sawada & Morimoto 1985: 180 [key], 184 [redescription], figs. 1, 15, 16, 27; Sawada 1986: 44 [distribution; host records]; Sawada & Morimoto 1986: 197 [biology; morphology]; Lee & Morimoto 1988: 217 [key to larva], 237 [description of larva].

Euops polita: Voss 1924a: 44 [key], 57 [catalogue; comparison with *E. phaedonia* Sharp]; Voss 1924b: 279 [comparison with *E. indigenus* Voss]; Voss 1925: 298 [key]; Kôno 1927: 40 [key], 44 [catalogue]; Dalla Torre & Voss 1930: 34 [catalogue]; Hirano 1954: 3-4 [comparison with *E. punctatostriatus* (Motsch.); host record; redescription]; Voss 1957: 99 [comparison with *E. keiseri* Voss]; Chûjô & Morimoto 1959: 147 [key]; Matoba 1975: 19 [catalogue], 20 [diagnosis]; Hayashi et al. 1984: 259, pl. 51, fig. 9; Sawada & Morimoto 1985: 184 [catalogue]; Morimoto 1992: 6 [key].

punctatostriatus (Motschulsky) Japan

Atellabus [sic] *punctato-striatus* Motschulsky, 1860: 22 [description]; Matoba 1975: 20 [catalogue]; Sawada & Morimoto 1985: 182 [catalogue].

Attelabrus punctato-striatus: Lewis 1879: 22 [catalogue].

Attelabus punctato-striatus: Schilsky 1903: p. Y [catalogue]; Jacobson 1904: XXXV [alleged synonymy with *E. lespedezae* Sharp]; Kôno 1927: 42 [catalogue]; Hirano 1954: 4 [catalogue].

Attelabus punctatostriatus: Lacordaire 1863: 628 [catalogue].

Attelabus punctatostiata: Yoon & Bae 1986: 35 [catalogue].

Attelabus (*Euops*) *punctato-striatus*: Schönfeldt 1891: 264 [catalogue].

Cyphus punctatostriatus: Schönfeldt 1887:146 [catalogue].

Euops punctatostriatus: Sawada & Morimoto 1985: 181 [key], 182 [redescription], figs. 2, 7, 17, 24; Sawada 1986: 43 [distribution, host records]; Sawada & Morimoto 1986: 197 [biology, morphology]; Morimoto 1992: 5 [key].

Euops punctato-striatus: Faust 1895: 234 [comparison with *E. togoensis* Faust].

? *Euops punctato-striatus*: Sharp 1889: 56; Kôno 1927: 42 [catalogue]; Sawada & Morimoto 1985: 182 [catalogue].

Euops punctatostriata: Voss 1924a: 43 [key], 55 [catalogue]; Voss 1925: 297 [key]; Kôno 1927: 42 [catalogue]; Dalla Torre & Voss 1930: 34 [catalogue]; Kôno 1930: 15 [biology], 28 [host record]; Paik 1936: 122 [doubtful record for Korea]; Ter-Minassian 1950: 179 [key], 180 [redescription]; Yuasa & Kôno 1950: 1284 [illustration; description in Japanese]; Dalla Torre & Voss 1953: 14 [catalogue]; Hirano 1954: 4-6 [descriptive comments; host record]; Chûjô & Morimoto 1959: 147 [key]; Nakane et al. 1963: 335, pl. 178; Matoba 1975: 19 [key], 20 [diagnosis]; Hayashi et al. 1984: 260, pl. 51, fig. 11; Sawada & Morimoto 1985: 182 [catalogue]; Yoon & Bae 1986: [catalogue; discussion on doubtful record for Korea].

Euops punctato-striata: Kôno 1927: 39 [key], 42 [catalogue; new records]; Yokoyama 1931: 61, pl. 8; Sawada & Morimoto 1985: 182 [catalogue].

Euops punctato-striata f. *awana* Kôno 1927: 39 [key], 43 [description]; Dalla Torre & Voss 1930: 35 [catalogue]; Hirano 1954: 6; Matoba 1975: 20 [catalogue]; Sawada & Morimoto 1985: 183 [catalogue].

phaedonius (*Euops*) Sharp, 1889: 56 [description]; Schilsky 1903: p. X [catalogue]; Voss 1924a: 55 [catalogue; possible synonymy with *E. punctatostriatus* (Motschulsky)]; Kôno 1927: 43 [catalogue]; Marshall 1948: 412 [comparison with *nigricollis* Marshall]; Hirano 1954: 4 [catalogue]; Sawada & Morimoto 1985: 182 [catalogue; synonymy].

Attelabus (*Euops*) *phaedonius* Sharp: Schönfeldt 1891: 264 [catalogue].

Euops phaedonia: Voss 1924a: 43 [key]; Voss 1925: 297 [key]; Dalla Torre & Voss 1930: 34 [catalogue]; Kôno 1950: 1284 [description in Japanese]; Sawada & Morimoto 1985: 182 [catalogue; synonymy].

puncticollis (*Euops*) Schilsky [nec Boheman, 1859], 1906: 92 [description]; Kôno 1927: 42 [catalogue]; Voss 1924a: 55 [synonymy]; Dalla Torre & Voss 1930: 35 [catalogue]; Hirano 1954: 4 [catalogue]; Matoba 1975: 20 [catalogue]; Sawada & Morimoto 1985: 183 [catalogue].

schilskyi (*Euops*) Voss, 1922b: 174 [new name for *puncticollis* Schilsky]; Voss 1924a: 55 [synonymy]; Kôno 1927: 42 [catalogue]; Dalla Torre & Voss 1930: 35 [catalogue]; Hirano 1954: 4 [catalogue]; Sawada & Morimoto 1985: 183 [catalogue].

aceri (*Euops*) Kôno, 1926: 222 [biology], 223 [description]; Matoba 1975: 20 [catalogue]; Sawada & Morimoto 1985: 183 [catalogue].

Euops punctato-striata f. *aceri*: Kôno 1906: 223 [description]; Kôno 1927: 40 [key], 43 [catalogue].

Euops punctatostriata f. *aceri*: Kôno 1930: 15, 28 [biology; host record]; Dalla Torre & Voss 1930: 35 [catalogue]; Dalla Torre & Voss 1953: 14 [catalogue]; Hirano 1954: 6 [catalogue].

pustulosus Sharp Japan

Euops pustulosus Sharp, 1889: 56 [description], 57 [host record]; Schilsky 1903: p. X [catalogue]; Schilsky 1906: 91 [redescription]; Voss 1924a: 43 [key], 56 [catalogue; descriptive note]; Kôno 1927: 40 [catalogue]; Hirano 1954: 1 [catalogue]; Sawada & Morimoto 1985: 178 [key], 194 [description], figs. 18, 31; Sawada 1986: 44 [host record]; Sawada & Morimoto 1986: 198, 201, fig. 11 [biology; morphology]; Morimoto 1992: 5 [key].

Euops pustulosa: Voss 1924a: 43 [key], 56 [catalogue; descriptive note]; Voss 1924b: 279 [comparison with *E. striata* Voss]; Voss 1925: 297 [key]; Kôno 1927: 39 [key], 40 [designation as type species for *Kobusynaptops* Kôno]; Dalla Torre & Voss 1930: 33 [catalogue]; Hirano 1954: 1-3 [host record; redescription], fig. 1; Iga 1955: 143 [description in Japanese], pl. 51 [illustration]; Kinki Coleopterological Society, 1956: pl. 63, fig.1408; Chûjô & Morimoto 1959: 146 [key]; Nakane et al. 1963: 335, pl. 178; Matoba 1975: 19 [diagnosis; key]; Shirozu & Miyata 1976: 711 [new record]; Hayashi et al. 1984: 259, pl. 51, fig. 6; Sawada & Morimoto 1985: 194 [catalogue].

Attelabus pustulosus: Schönfeldt 1891: 264 [catalogue].

splendidus Dalla Torre & Voss Japan, Korea [?]

Euops splendida: Dalla Torre & Voss, 1930: 35 [catalogue; new name for *splendens* Roelofs]; Kôno 1930: 28 [host record]; Yuasa 1932: 532; Kato 1933: pl. 22 [illustration; comments in Japanese]; Kôno & Kim 1937: 10; Ter-Minassian 1950: 179 [key], 180 [redescription], pl. 2, fig. 2; Yuasa & Kôno 1950: 1285 [illustration; description in Japanese]; Dalla Torre & Voss 1953: 14 [catalogue]; Hirano 1954: 7 [catalogue; host records]; Iga 1955: 143 [description in Japanese], pl. 51 [illustration]; Kinki Coleopterological Society 1956: pl. 63, fig.1409; Cho 1957: 101; Chûjô & Morimoto 1959: 146 [key]; Nakane et al. 1963: 335, pl. 178 [illustration]; Suda 1965: 232 [illustration], 568 [comment in Japanese]; Cho 1969: 565; Gu 1973: 149; Matoba 1975: 19 [diagnosis; key]; Hayashi et al. 1984: 259, pl. 51, fig. 8; Sawada & Morimoto 1985: 191 [catalogue]; Sakurai 1985: 151-156 [biology, morphology]; Yoon & Bae 1986: 34 [catalogue; diagnosis; record for Korea].

Euops splendida f. *nigra*: Kôno 1950: 1285 [description in Japanese]; Iga 1955: 143; Sawada & Morimoto 1985: 192 [catalogue].

Euops splendidus: Sawada & Morimoto 1985: 179 [key], 191 [redescription], figs. 8, 9, 13, 33; Sawada & Morimoto 1986: 197-205, figs.7-10, 12, 15-16, 18 [biology; morphology]; Lee & Morimoto 1988: 218 [key to larva], 237 [description of larva]; Lee 1992: 160 [description of larva]; Sakurai 1992: 230 [behaviour; recognition]; Morimoto 1992: 5 [key].

splendens (*Attelabus (Euscelus?)*) Roelofs [nec Gyllenhall, 1839] 1874: 139 [decription]; Kôno 1927: 41 [catalogue]; Hirano 1954: 7 [catalogue]; Matoba 1975: 19 [catalogue]; Sawada & Morimoto 1985: 191 [catalogue].

Attelabus (Euscelus) splendens: Heyden 1879: 356 [descriptive note, host record, new record]; Kôno 1927: 41 [catalogue].

Attelabrus splendens: Lewis 1879: 22 [catalogue].

Cyphus splendens: Schönfeldt 1887:147 [catalogue].

Attelabus (Euops) splendens: Schönfeldt 1891: 264 [catalogue].

Euops splendens: Sharp 1889: 55 [redescriptive notes; host record]; Voss 1924a: 43 [key], 56 [catalogue; descriptive note]; Voss 1925: 297 [key]; Kôno 1927: 39 [key], 41 [catalogue; descriptive note]; Yokoyama 1931: 60, pl. 8; Voss 1939c: 615 [new record]; Voss 1942: 102 [comparison with *E. cuprifulgens* Voss]; Sawada & Morimoto 1985: 191 [catalogue]; Yoon & Bae 1986: 34 [catalogue].

Euops splendens Var. a: Schilsky 1903: 61 [redescription].

Euops splendens f. *nigra* Kôno 1927: 39 [key], 41 [descriptive note]; Dalla Torre & Voss, 1930: 35 [catalogue]; Matoba 1975: 19 [catalogue]; Sawada & Morimoto 1985: 190 [catalogue]; Yoon & Bae 1986: 34 [catalogue].

Catalogue of *Euops* species of the Seychelle Islands

viriditinctus Champion — Seychelle Is.

Euops viriditinctus Champion, 1914: 395 [description], pl. 22, fig.1; Hustache 1924: 558 [footnote]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue].

Catalogue of *Euops* species of Wallacea

aerosus aerosus Pascoe — Indonesia (Maluku: Batchian, Sula), Malaysia (Sarawak)

Euops aerosa Pascoe, 1874: 28 [description; comparison with *E. plicatus* Pascoe]; Voss 1924a: 62 [catalogue]; Voss 1925: 301 [catalogue]; Voss 1929: 217 [key], 222 [redescription], 223 [comparison with *E. willemoesi* Baer]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1933b: 168 [key]; Voss 1935c: 519 [comparison with *E. subdentatus* Voss]; Dalla Torre & Voss 1953: 15 [catalogue].

aerosus mindanaoensis Voss — Philippines (Mindanao)

Euops aerosa f. *mindanaoensis*: Voss, 1933b: 168 [key/description]; Dalla Torre & Voss 1953: 15 [catalogue].

anceps Voss — Malaysia (Sabah), Philippines ("Banguey island [?]", Mindanao, Palawan)

Euops anceps Voss, 1924a: 44 [key], 58 [description]; Voss 1925: 298 [key]; Voss 1929: 216 [key]; Voss 1933b: 171 [key]; Dalla Torre & Voss 1953: 15 [catalogue].

apicalis Voss — Philippines (Luzon)

Euops apicalis Voss, 1933b: 166 [key/description]; Voss 1935a: 97 [comparison with *andrewesi* Voss]; Dalla Torre & Voss 1953: 15 [catalogue].

boviei Voss — Philippines (Luzon, Mindanao, Mindoro)

Euops boviei Voss, 1924a: 64 [description]; Voss 1925: 299 [key]; Voss 1929: 217 [key]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1933b: 169 [key]; Dalla Torre & Voss 1953: 15 [catalogue].

Euops willemoesi: Voss 1924a: 45 [key], 62 [catalogue; new records]; Dalla Torre & Voss 1930: 35 [catalogue].

cribrarius Voss — Philippines (Luzon)

Euops cribraria Voss, 1933b: 165 [key/description]; Dalla Torre & Voss 1953: 15 [catalogue].

cupreus Voss — Philippines (Luzon)

Euops cuprea Voss, 1933b: 167 [key/description], fig. 1d; Dalla Torre & Voss 1953: 15 [catalogue].

cuprinus Voss Philippines (Luzon)

Euops cuprina Voss, 1956c: 420 [description].

cupripennis Voss Philippines ("Macba" [?])

Euops cupripennis Voss, 1933b: 169 [key/description]; Dalla Torre & Voss 1953: 15 [catalogue].

cyanellus Voss Philippines (Leyte, Luzon, Mindanao, Siargao)

Euops cyanella Voss, 1922c: 158 [description]; Voss 1924a: 44 [key], 58 [catalogue; new records]; Voss 1925: 298 [key]; Voss 1929: 216 [key]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b [key; new records]: 172; Dalla Torre & Voss 1953: 15 [catalogue].

dentatus Voss Philippines (Luzon)

Euops dentata Voss, 1924a: 45 [key], 61 [description]; Voss 1925: 299 [key]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 168 [key/redescription], fig. 1c; Dalla Torre & Voss 1953: 15 [catalogue].

divisus Pascoe Indonesia (Maluku: Batchian; Irian Jaya: Mysol, Salawatti, Manokwari)

Euops divisa Pascoe, 1874: 29 [description], pl. 3, fig. 6; Voss 1924a: 40 [key], 48 [catalogue]; Voss 1925: 294 [key]; Voss 1929: 214 [key].

elongatus Voss Philippines (Luzon)

Euops elongata Voss, 1925: 300 [key, description]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 165 [key/redescription]; Dalla Torre & Voss 1953: 15 [catalogue].

fuscocupreus Voss Philippines (Luzon)

Euops fuscocuprea Voss, 1933b: 171 [key/description]; Dalla Torre & Voss 1953: 15 [catalogue].

jucundus jucundus Voss Philippines (Mindanao, Mindoro)

Euops jucunda Voss, 1933b: 167 [key/description], fig. 1b; Dalla Torre & Voss 1953: 15 [catalogue].

jucundus obscurus Voss Philippines (Luzon)

Euops jucunda f. *obscura* Voss, 1933b: 167 [key/description]; Dalla Torre & Voss 1953: 15 [catalogue].

moseri Voss Philippines (Luzon)

Euops moseri Voss, 1933b: 164 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

palawanus palawanus Voss Philippines (Luzon, Mindanao, Palawan)

Euops palawana Voss, 1924a: 45 [key], 60 [description], 61 [comparison with *E. subopaca* Voss]; Voss 1925: 299 [key]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 170 [key; new records]; Dalla Torre & Voss 1953: 16 [catalogue].

Euops palawana f. *tristicula* Voss 1933b: 170 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

palawanus azureus Voss Philippines (Mindanao)

Euops palawana f. *azurea* Voss, 1933b: 170 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

parvulus Voss Philippines (Mindoro)

Euops parvula Voss, 1933b: 168 [key/description], fig. 1e; Dalla Torre & Voss 1953: 16 [catalogue].

plicatus Pascoe Indonesia (Sulawesi)

Euops plicata Pascoe, 1874: 28 [description; comparison with *E. aerosa* Pascoe]; Pascoe 1885: 232 [new record]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Voss 1929: 216 [key], 222 [redescription]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 166 [key]; Dalla Torre & Voss 1953: 16 [catalogue].

rufitarsis rufitarsis Voss — Philippines (Luzon, Mindanao, Polillo, Samar)

Euops rufitarsis Voss, 1933b: 169 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

Euops rufitarsis f. *viridisticta* Voss 1933b: 169 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

rufitarsis cyanicolor Dalla Torre & Voss — Philippines (Mindanao)

Euops rufitarsis f. *cyanicolor* Dalla Torre & Voss, 1953: 16 [catalogue; replacement name for f. *cyanea* Voss nec Marshall].

Euops rufitarsis f. *cyanea* Voss [nec Marshall, 1906], 1933b: 170 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

schultzei Voss — Philippines (Luzon, Mindoro)

Euops schultzei Voss, 1922c: 160 [description]; Voss 1924a: 45 [key], 62 [catalogue]; Voss 1925: 300 [key]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 166 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

semicupreus Voss — Philippines (Luzon)

Euops semicuprea, Voss, 1924a: 45 [key], 60 [description]; Voss, 1925: 299 [key]; Dalla Torre & Voss, 1930: 36 [catalogue]; Voss, 1933b: 171 [key; new records]; Dalla Torre & Voss, 1953: 16 [catalogue].

subopacus Voss — Indonesia (Sulawesi)

Euops subopaca Voss, 1924a: 44 [key], 59 [description], 61 [comparison with *E. palawanus*]; Voss 1925: 299 [key]; Voss 1928: 363 [comparison with *E. blandus* Voss]; Dalla Torre & Voss 1930: 36 [catalogue].

trigemmatus Pascoe — Indonesia (Maluku: Batchian; Irian Jaya), Australia? (Queensland?)

Euops trigemmata Pascoe, 1874: 28 [description]; Lea 1898: 618 [comparison with *E. strigiventris* Lea]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Dalla Torre & Voss 1930: 37 [catalogue]; Zimmerman 1994: 554 [catalogue; discussion on record for Australia].

Euops trigeminata: Pascoe 1885: 233 [new record]; Zimmerman 1994: 554 [catalogue].

turbaticollis Voss — Philippines (Mindanao)

Euops turbaticollis Voss, 1933b: 165 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

violaceus Pascoe — Indonesia (Maluku: Ceram)

Euops violacea Pascoe, 1874: 27 [description]; Voss 1924a: 63 [catalogue]; Voss 1925: 302 [catalogue]; Voss 1929: 216 [key], 221 [redescription]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 172 [key]; Dalla Torre & Voss 1953: 16 [catalogue].

viridifuscus Voss — Philippines (Luzon, Panay, Mindanao)

Euops viridifusca Voss, 1922c: 159 [description]; Voss 1924a: 45 [key], 62 [catalogue; new records]; Voss 1925: 300 [key]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 164 [key/redescription], fig. 1a; Dalla Torre & Voss 1953: 16 [catalogue].

viridiventris Heller — Indonesia (Maluku: Buru)

Euops viridiventris Heller, 1929: 112 [description]; Dalla Torre & Voss 1930: 35 [catalogue]; Voss 1930: 83 [comparison with *E. singularis* Voss, *E. viridiceps* Voss].

viridulus Voss — Philippines (Luzon)

Euops viridula Voss, 1933b: 171 [key/description]; Dalla Torre & Voss 1953: 16 [catalogue].

vossi Heller — Indonesia (Maluku: Buru)

Euops vossi Heller, 1929: 111 [description], fig. 3; Dalla Torre & Voss 1930: 32 [catalogue].

willemoesi Baer Philippines (Luzon, Palawan)

Euops willemoesi Baer, 1886: 145 [new name for *E. jekeli* Roelofs]; Schultze 1916: 140 [catalogue]; Voss 1924a: 63 [synonymy with *E. roelofsi* Voss]; Voss 1925: 299 [key]; Voss 1929: 223 [comparison with *E. aerosus* Pasc.]; Dalla Torre & Voss 1930: 36 [catalogue]; Voss 1933b: 170 [key]; Dalla Torre & Voss 1953: 16 [catalogue].

jekeli (*Euops*) Roelofs [nec Pascoe], 1876: 8 [description]; Schultze 1916: 140 [catalogue]; Dalla Torre & Voss 1930: 36 [catalogue].

roelofsi (*Euops*) Voss, 1922c: 159 [new name for *E. jekeli* Roelofs; unnecessary replacement name]; Voss 1924a: 45 [key], 60 [catalogue, new record], 63 [synonymy]; Dalla Torre & Voss 1930: 36 [catalogue].

Catalogue of *Euops* – nomina nuda

postocularis Lea (nomen nudum)

Euops postocularis Lea, 1929: 542 [comparison with *E. episternalis* Lea].

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Index

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Isotomurus nebulosus, a new Pyrenean species of the *palustris* group

(Insecta, Collembola, Isotomidae)

Sithan Lek and **Antonio Carapelli**

Lek, S. & A. Carapelli (1998): *Isotomurus nebulosus*, a new Pyrenean species of the *palustris* group (Insecta, Collembola, Isotomidae). – Spixiana **21/2:** 125-128

A new species of hydrophilous *Isotomurus* (Börner, 1903), *I. nebulosus*, spec. nov. is described from central Pyrenees, with remarks about coloration patterns as taxonomic characters in the genus.

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Introduction

The wet habitats of Europe bear a high diversity of Collembola of the hydrophilous genus *Isotomurus*, which are currently under study in our laboratories. The new species described here, *I. nebulosus*, spec. nov. was found in large numbers at several sites in the central Pyrenees, in association with other species of the genus.

Isotomurus nebulosus, spec. nov.

Figs 1-5

Types. Holotype: ♂, France, Haute-Garonne, Arbas, humid mosses on slopes at the entry of the Goueil di her cave, altitude 477m, june 1995. – Paratypes: 32, with same data. Types deposited in the collection of the Laboratoire d'Ecologie Terrestre, Université Paul Sabatier, Toulouse (France).

Description

Length. 2 mm.

Habitus. Habitus of *Isotomurus palustris* Müller 1776 (Fig. 1); claws and mucro not elongated.

Coloration. Yellowish brown. Pigmentation always present on antennae, especially on antennomere IV. Dorsal face of head and the cheeks yellowish, with a brown strip(e) between the antennal bases and a small brown median spot behind at ⅓ of head length; body yellowish to light brown with slight drawing all over, ventral face lighter, yellowish. No longitudinal nor transversal stripes on tergites. 1 + 1 ventro-lateral brown spots on abdomen VI. Some large specimens have a darker background coloration. Thin borders pigmented in dark violet present on the lateral margins of the abdominal tergites III, IV and V. Empodium and claw pigmented. Legs and furca whitish.

Antennae. Of normal length for the *palustris* group, not elongated. Seven to nine short and thick S-chaetae on antennomere I and several on antennomeres II to IV.

Head. 8+8 eyes. Postantennal organ small and rounded. PAO/dcA = 0.9. Basal part of the labium with 10-15 chaetae. External lobe of the maxilla with 4 sublobal hairs (Fig. 2).

Tergites. Multiperforated sensory areas (pseudocelli-like, cf Deharveng 1980) present on the tergites, at least from thorax II to abdomen III. Dense coating of ordinary chaetae, differentiated in smooth mesochaetae and long ciliated macrochaetae. Long trichobothria, thin and ciliated, 3 + 3 on abdomen II, 3 + 3 on abdomen III (the lateral one shorter) and 1 + 1 on abdomen IV (Fig. 3). No modified chaetae on abdomen III of the male; the macrochaeta near the external posterior angle of abdomen III very similar in both sexes; it is straight, long, hyaline, acute at the apex but not tapered (Fig.4). The following S-chaetae were detected on each side of the tergites (Fig. 5): 4 accp + 1 al + 1 ms on thorax II, thorax III and abdomen I; 5 accp + 1 al + 1 ms on abdomen II, 6 accp + 1 ms on abdomen III, 5 accp + 4 as on abdomen IV and 5 accp (the 2 internal longer) + 2 as on abdomen V (nomenclature of Deharveng, 1979).

Appendages. Ventral tube with 3 + 3 distal chaetae. Claw without internal or lateral tooth. Empodial appendage with an internal tooth. Tibiotarsal chaetotaxy of smooth ordinary chaetae and several ciliated macrochaetae. Femur with a long ciliated ventral macrochaeta. Tenaculum with 14 to 32 chaetae. Mucro quadridentate, without mucronal chaeta. Dentes ventrally with ciliated chaetae on the basal ⅓, and none more distally; dorsally, chaetae are thinner, smooth and short; the internal side has ciliated chaetae, long in the basal ⅓, and short in the distal ⅔: externally, chaetae are medium or short and ciliated. No modified chaetae on anterior subcoxae of the male.

Derivatio nominis. *Nebulosus*, from the blurred coloration pattern of the species

Additional material. France: Ariège, Montségur, Montagne de Tabe, ruisseau du Lasset (1100 m), in numerous samplings made in 1994; Ariège, Arbon, Ruau (784 m), in numerous samplings made in 1994-1995; Ariège, Izaut de l'Hotel, source de la Maure (436 m), in numerous samplings made in 1994-1995.

Affinities and discussion

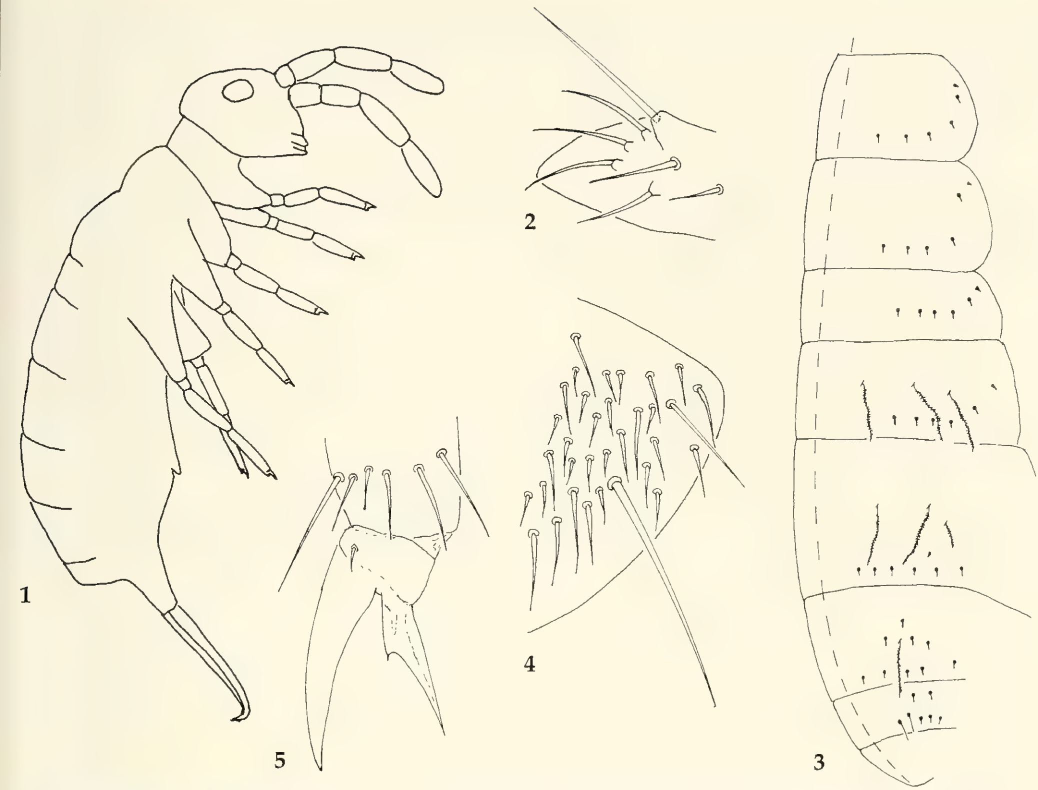
Isotomurus nebulosus has the chaetotaxic characteristics of the widespread *I. palustris* group as defined by Deharveng & Lek (1993), with a typical trichobothrial formula (3 + 3 + 1 on abdomina II, III and IV) and an identical distribution of S-chaetae on tergites of abdomina IV-V (3 as + 4 accp chaetae on abdomen IV, and 2 as + 5 accp chaetae on abdomen V). We give here the complete S-chaetotaxy of the tergites for *I. nebulosus* (Fig. 5), which seems to be very close to that of the other species of the group. The new species can be separated from the other forms of the *palustris* group by its colour pattern and the number and morphology of the modified male chaetae on abdomen III although this latter character is still unknown in several species.

Among the *Isotomurus* devoid of a dark longitudinal strip on the tergite axis, *I. nebulosus* has a color pattern similar to that of *I. maculatus*, Stach 1947 (= *I. hortorum* Cassagnau 1987 after Carapelli 1995). The dorsal drawings are however always blurred and poorly marked in the new species, whereas they are clear-cut (blue-grey on yellowish background) in *maculatus*. A differential character with *I. prasinus* Reuter, 1891, a species of the *palustris*-group devoid of dorsal drawings, is the absence of modified chaetae in the male. The several short, thickened and strongly ciliated chaetae present on abdomen III and on the anterior subcoxae in *I. prasinus* are absent in *I.nebulosus*.

Remarks on colour patterns in *Isotomurus*

The taxonomy of the genus *Isotomurus* is mostly based on the patterns of body pigmentation. The importance of this character is a consequence of the difficulty to study ordinary chaetotaxy, because of the intense plurichaetosis and the large variability in number of chaetae observed in all species of the genus. Most European forms of *Isotomurus*, and more particularly the "varieties" of the species *I. palustris* (Müller 1776), were primarily described on the basis of their colour patterns (Stach 1947, Poinsot-Balaguer 1976, Cassagnau 1987). However, the latter author suggested that these chromatic forms might correspond to species, as their colour pattern did not vary during breeding experiments (Cassagnau personal communication). This view received a strong support from Carapelli et al. (1995a, 1995b) who were able to show by the use of molecular markers that several of these varieties were good species.

The models of pigmentation observed in *Isotomurus* species correspond to four different groups:



Figs 1-5. *Isotomurus nebulosus,* spec. nov. **1.** Habitus. **2.** External lobe of maxilla. **3.** Dorsal chaetotaxy of S-chaetae and trichobothria. **4.** Ventro-lateral chaetotaxy of abdomen III. **5.** Apex of leg III.

1. Models exhibiting a longitudinal strip along the medial part of tergites with or without other colour pattern. (*I. alticolus* Carl, 1899, *I. palustris* Müller, 1776, *I. unifasciatus* Börner, 1901, *I. aquatilis* Müller, 1776 and *I. indipendente,* Carapelli et al., 1995).
2. Models with uniform coloration (*I. cassagnaui* Deharveng & Lek, 1993, *I. italicus* Carapelli et al., 1995, *I. palliceps* Uzel, 1891 and *I. prasinus* Reuter, 1891).
3. Models showing transversal bands (*I. balteatus* Reuter, 1896 and *I. rabili* Deharveng & Lek, 1993).
4. Models with irregular patches of pigmentation (*I. maculatus* Schaeffer, 1896, *I. nebulosus,* spec. nov.).

Although there is a growing evidence that colour patterns are good specific characters in *Isotomurus,* they do not fit the groups based on chaetotaxy by Deharveng & Lek (1993). Thus, species with longitudinal stripes (chromatic group 1) belong to either the *palustris* group (*I. unifasciatus, I. aquatilis*), or the *alticolus* group (*I. alticolus*). Colour pattern has to be considered as specific rather than supraspecific character. *Isotomurus* is not an isolated case among Collembola in this respect, as the species taxonomy of at least two other large genera (*Orchesella* Templeton, 1835 and *Entomobrya* Rondani, 1861) is based on coloration.

Acknowledgements

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Microhypsibiidae, new family of eutardigrades, and description of the new genus *Fractonotus*

(Tardigrada)

Giovanni Pilato

Pilato, G. (1998): Microhypsibiidae, new family of eutardigrades, and description of the new genus *Fractonotus* (Tardigrada). – Spixiana **21/2:** 129-134

The structure of the claws of *Microhypsibius* type, of *Calohypsibius* type, of *Eohypsibius* type and of *Hypsibius* type is analyzed. The proposed new family Microhypsibiidae is described. Two genera are assigned to it: *Microhypsibius* Thulin, 1928 and *Fractonotus*, gen. nov. The latter differs from the former in the presence of a pair of elliptical organs on the head, and in characteristics of the bucco-pharyngeal apparatus.

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Introduction

The claws of the eutardigrades, in relation to the reciprocal position of the basal portion, of the main branch and the secondary branch, and to the type of connexion between the branches, can have different structure (i.e. it can be different the model according to which the claw is built). The claws of each model can have different shape.

Pilato (1969) stressed the significance of the claw structure which is considered a conservative character, phylogenetically very significant (Pilato 1969, 1975, 1982, Bertolani 1981, Bertolani & Kristensen 1987); the families are distinguished from one another on the basis of the symmetric or asymmetric arrangement of the diploclaws with respect to the median plane of the legs, and/or on the basis of the claw structure.

Thulin (1928), describing the genus *Microhypsibius*, considered its claws similar to those of the genus *Calohypsibius* Thulin, 1928. Marcus (1929) did not consider *Microhypsibius* a valid genus and transferred *Microhypsibius truncatus* Thulin, 1928 to *Calohypsibius*, considered by him as a subgenus of *Hypsibius*. Pilato (1969) defined more precisely the structure of the claws of *Calohypsibius* type, gave back generic rank to *Calohypsibius* and instituted the family Calohypsibiidae to which he ascribed the eutardigrades having claws of *Calohypsibius* type.

Since he could not examine any species attributed to *Microhypsibius*, Pilato (1969) did not express any opinion about that genus. Kristensen (1982) revalidated the genus *Microhypsibius* Thulin, 1928 and described two new species: *Microhypsibius bertolanii* and *M. minimus*. Kristensen, in agreement with Thulin, considered the claws of *Microhypsibius* similar to those of *Calohypsibius*, therefore he ascribed the genus *Microhypsibius* to the family Calohypsibiidae. Pilato (1982) suggested that *Microhypsibius* does not have claws of *Calohypsibius* type and that this genus cannot be ascribed to the family Calohypsibiidae. Bertolani & Kristensen (1987) stressed the differences between the claws of *Microhypsibius* (which they described as small, rigid, with a common basal segment and without clear internal limits between the three parts) and those of *Calohypsibius* type. They removed *Microhypsibius*

from the family Calohypsibiidae and transferred it to the family Hypsibiidae. Ito (1991) described *Microhypsibius japonicus* but considered it a member of the family Calohypsibiidae.

Material

Specimens of *Microhypsibius truncatus, M. bertolanii, M. minimus, Calohypsibius ornatus, Calohypsibius caelatus* were examined, and the claws of *Microhypsibius* were compared with those of the Calohypsibiidae, Hypsibiidae and Eohypsibiidae.

Results

In the claws of *Calohypsibius* type (Figs 1a, b) the secondary branch is rigidly joined to the primary branch from the base of the claw (the suture is clearly visible). The basal portion of the claw is therefore wide, stumpy, without a narrow "peduncular" portion. Moreover, in all known species of Calohypsibiidae the two diploclaws of each leg are similar to one another in shape and size; the claws are small (sometimes extremely small); the secondary branch in many cases is reduced.

In the claws of Eohypsibiidae (Fig. 1c) the three, clearly distinguishable, portions of the claw (basal portion, secondary branch and main branch) are sequentially arranged in the above mentioned order and distinct from one another by a septum. The internal claws can rotate on their bases, sometimes simulating the symmetric arrangement of the claws with respect to the median plane of the leg.

In the claws of the Hypsibiidae (Fig. 1d) a basal portion, often long and narrow, is present, continuous with the secondary branch; the primary branch is joined to the secondary branch through a flexible connection. In some cases this connection is very slightly sclerified: in a few cases (hind legs of *Eremobiotus* and, perhaps, some species of *Isohypsibius*) it is highly sclerified so that the connection appears to be rigid. Moreover, in the species having claws of Hypsibiidae type, the two claws of each leg are different in shape and size from one another. None of the known species of Hypsibiidae (more than 220) has claws with clearly reduced secondary branch.

The claws of *Microhypsius* type, like those of the Hypsibiidae, have a fairly long, narrow, basal portion (Fig. 1e). Differently from the claws of the Hypsibiidae, this portion seems to be continuous with the primary branch; the secondary branch is rigidly joined to the primary branch, therefore there is not a flexible connexion between the two branches. The two claws of each leg are slightly different in shape and size from one another.

The claws of *Microhypsibius* appear similar in shape to those of the Hypsibiidae, but the structure is different and therefore one can conclude that the species having claws of *Microhypsibius* type belong to a phyletic line about equidistant from that of the Hypsibiidae and from those of the Calohypsibiidae and of the Eohypsibiidae.

The claws of *Microhypsibius* type, like those of the Hypsibiidae and Eohypsibiidae, but unlike those of the Calohypsibiidae, have a narrow, "peduncular", basal portion. Like in the claws of the Calohypsibiidae but unlike those of the Hypsibiidae and Eohypsibiidae, the basal portion seems to be continuous with the primary branch. The claws of *Microhypsibius* type, like those of the Calohypsibiidae and the Eohypsibiidae, but unlike those of the Hypsibiidae, have the secondary and the primary branches rigidly joined to one another. Unlike the claws of the Eohypsibiidae, in the claws of *Microhypsibius* type, the basal portion, the secondary branch and the primary branch are not sequentially arranged, and the internal claws cannot rotate on their bases.

It seems justified to conclude that the species having claws of *Microhypsibius* type might belong to an evolutionary line to which the value of family or of subfamily of Hypsibiidae, could be attributed. I consider the institution of a new family (Microhypsibiidae) better justified than the institution of a new subfamily (within the family Hypsibiidae), both because the significance of the structural differences of the claws, and because the three extant subfamilies of Hypsibiidae (Hypsibiinae, Itaquasconinae and Diphasconinae) do not differ from each other in the structure of the claws.

The proposed new family, named Microhypsibiidae, can be defined as follows:

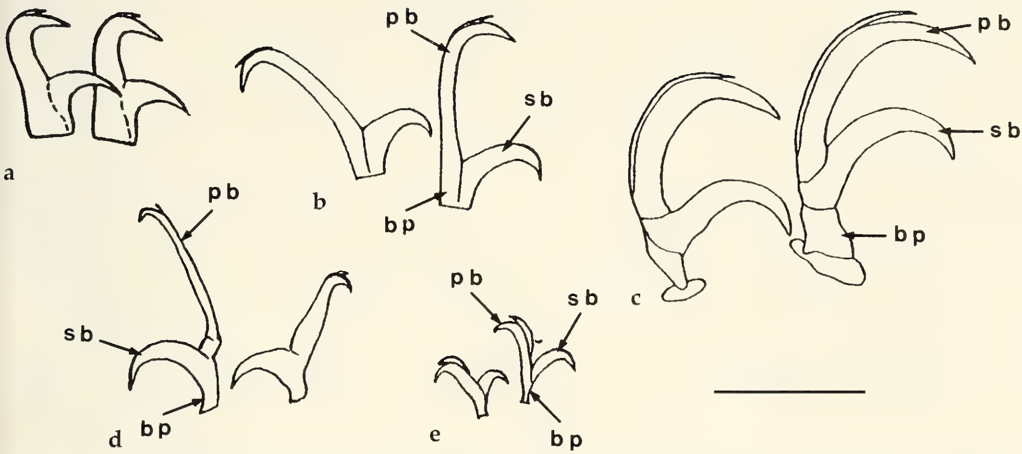

Fig. 1. Claws. **a, b.** *Calohypsibius* type. **c.** *Eohypsibius* type. **d.** Hypsibiidae type. **e.** *Microhypsibius* type (*Fractonotus caelatus*). bp: basal portion; pb: primary branch; sb: secondary branch. Scale bar = 10 μm.

Microhypsibiidae, fam. nov.

Diagnosis. Eutardigrades having claws arranged asymmetrically with respect to the median plane of the legs. Claws of *Microhypsibius* type: the claws have a narrow basal portion continuous with the primary branch; the secondary branch is rigidly joined to the primary branch. The internal claws cannot rotate on their bases.

Two genera belong to the new family: *Microhypsibius* Thulin, 1928 and *Fractonotus*, gen. nov. (described below).

Microhypsibius Thulin, 1928

All known species having claws of *Microhypsibius* type are presently ascribed to the genus *Microhypsibius* (*M. truncatus* Thulin, 1928; *M. bertolanii* Kristensen, 1982; *M. minimus* Kristensen, 1982 and *M. japonicus* Ito, 1991).

Concerning the bucco-pharyngeal apparatus, Kristensen (1982) stated that *M. truncatus* and *M. minimus* have apophyses for the insertion of the stylet muscles in the shape of "ridges", whereas *M. bertolanii* has a thin strengthening bar (or ventral lamina).

In examining a paratype specimen in perfectly lateral view, I noted that *M. bertolanii* has no ventral lamina, and has apophyses for the insertion of the stylet muscles similar to those of *M. truncatus* and *M. minimus*. I noted also that in all these species, the apophyses for the insertion of the stylet muscles are not simple ridges. The ventral apophysis (Fig. 2b) is a well developed ridge having, at ⅔ of its length, a prominence in the shape of a blunt hook. The dorsal apophysis can be interpreted as a ridge split into two portions. The anterior portion forms, caudally, a little hook which is similar in shape to the hooks of *Hypsibius*, and which, therefore, can be defined a "semilunar hook". The caudal portion appears as a short thickening, gradually decreasing in height. The apex of the dorsal hook is very near to the wall of the buccal tube and therefore, when the specimens are not in lateral position, the hook is not clearly distinguishable and the apophysis seems in shape of a simple ridge.

The subdivision of the apophyses for the insertion of the stylet muscles into two portions is a common feature in some evolutionary lines of eutardigrades: it is evident in *Ramazzottius* (Binda & Pilato, 1986), in *Mixibius* (Pilato, 1992) and in *Acutuncus* (Pilato, 1997). Though not stressed in the literature, I consider that the extant apophyses for the insertion of the stylet muscles are corresponding to the anterior portion of primarily long ridges like those present in *Ramajendas* (Pilato & Binda, 1990). On the basis of the morphology of the apophyses, one can assume that:

a. in many evolutionary lines of eutardigrades, the primary ridges have split into two portions (the anterior formed the extant apophysis for the insertion of the stylet muscles, the caudal portion can be more or less reduced or completely absent);
b. in other evolutionary lines the primary ridges have undergone the reduction of their caudal portion without any breakage.

The reconstruction of the real evolutionary history of the the different genera remains an unsolved problem.

Defining the genera of the eutardigrades, I indicate the shape of the apophyses for the insertion of the stylet muscles, and it is evident that until now, I have only referred to the anterior portion of the primary ridge. However, it is necessary to add information about the caudal portion, if present. In *Microhypsibius,* as in many other genera, both apophyses have two thin caudal processes pointing posteriorly and laterally (Fig. 2a).

Kristensen (1982) considered both peribuccal lamellae and peribuccal papulae to be absent. Ito (1991) described *Microhypsibius japonicus* and considered small peribuccal lamellae to be present. However, Ito wrote: "the number of the lamellae cannot be counted because of their very thin structure". In the specimens of *Microhypsibius truncatus, Microhypsibius minimus,* and *Microhypsibius bertolanii* I examined, I was not able to see peribuccal lamellae or peribuccal papulae; I did not examined specimens of *Microhypsibius japonicus* and, therefore, the presence or absence of peribuccal lamellae or peribuccal papulae cannot be confirmed.

In conclusion, the genus *Microhypsibius* can be defined as follows:

Diagnosis. Microhypsibiidae; cephalic elliptical organ absent; buccal tube rigid; ventral lamina absent; apophyses for the insertion of the stylet muscles asymmetrical with respect to the frontal plane; ventral apophysis in the shape of a ridge with an evident "blunt hook"; dorsal apophysis split into two portions: the anterior in shape of "semilunar hook"; the caudal portion is a little, short, thickening. Both the dorsal and ventral apophyses with two very slender caudal processes pointing posteriorly and laterally. Peribuccal lamellae and peribuccal papulae absent (?); pharyngeal apophyses and placoids present; the two branches of the furcae of the stylets have thickened, swollen and rounded apices. Lunulae absent in the known species. Smooth eggs laid in the exuviae.

Type species: *Microhypsibius truncatus* Thulin, 1928.

Other species: *Microhypsibius minimus* Kristensen, 1982, *Microhypsibius bertolanii* Kristensen, 1982, and probably *Microhypsibius japonicus* Ito, 1991.

Fractonotus, gen. nov.

Calohypsibius ornatus (Richters, 1900) is a species of Calohypsibiidae widely variable as regards the cuticular ornamentations. Pilato (1989) suggested that under the name *Calohypsibius ornatus,* "various species, and perhaps genera, are gathered". Pilato, Claxton & Binda (1989) compared *Calohypsibius ornatus* (Richters, 1900) *caelatus* (Marcus, 1928) with the typical form and with *Calohypsibius ornatus carpaticus* (Bartos, 1940). These authors stated that to *Calohypsibius ornatus caelatus* must be attributed the value of bona species named *Calohypsibius caelatus* (Marcus, 1928). I studied this species again and the analysis of the claws demonstrated that they are not of *Calohypsibius* type but of *Microhypsibius* type (Fig. 1e). Therefore, this species must be transferred to the family Microhypsibiidae.

Because of the presence of a paired elliptical organ on the head, and the different shape of the apophyses for the insertion of the stylet muscles, *Calohypsibius caelatus* cannot be ascribed to the genus *Microhypsibius,* and a new genus has to be erected to accomodate it. In reference to the shape of the dorsal apophyses for the insertion of the stylet muscles I name it *Fractonotus.*

Diagnosis. Microhypsibiidae; paired elliptical organ present on the head; buccal tube rigid; ventral lamina absent. Dorsal and ventral apophyses for the insertion of the stylet muscles asymmetrical with respect to the frontal plane; the dorsal apophysis split into two clearly distinct portions (Figs 2c, d): the anterior portion is a stumpy hook with a blunt caudal apex, the caudal portion is a longitudinal thickening. The ventral apophysis (Fig. 2c) is a very slightly prominent ridge with no hook. Both the dorsal and ventral apophyses with two very slender caudal processes pointing posteriorly and later-

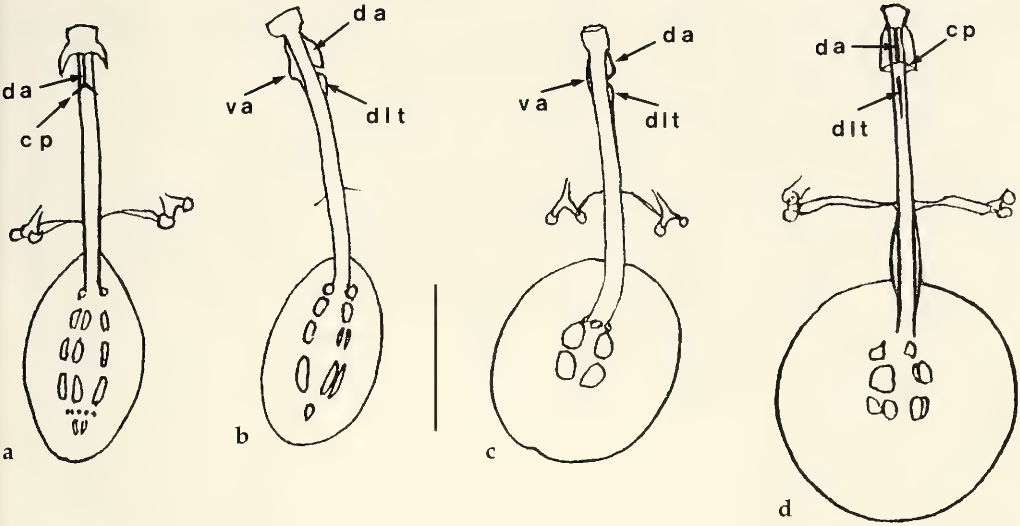

Fig. 2. Bucco-pharyngeal apparatus. **a.** *Microhypsibius minimus* Kristensen, 1982 in dorsal view. **b.** *Microhypsibius bertolanii* Kristensen, 1982 in lateral view. **c.** *Fractonotus caelatus* (Marcus, 1928) in lateral view. **d.** *Fractonotus caelatus* (Marcus, 1928) in dorsal view. cp: caudal processes; da: dorsal apophysis; dlt: dorsal longitudinal thickening; va: ventral apopohysis. Scale bar = 10 μm.

ally. Peribuccal lamellae and peribuccal papulae apparently absent. Posterior to the stylet supports, the lateral walls of the buccal tube have (Fig. 2d) a longitudinal thickening similar to that present in the genus *Ramazzottius*. Pharyngeal apophyses and placoids are present. The two branches of the furcae of the stylets have thickened, swollen and rounded apices. Lunulae absent in the known species. Smooth eggs laid in the exuviae.

Type species: *Calohypsibius ornatus* (Richters 1900) *caelatus* (Marcus, 1928).

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Size structure, relative growth and sanitary condition of a crayfish population (*Austropotamobius pallipes*) living in rocky pools

(Crustacea, Decapoda)

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Mori, M., S. Salvidio & P. Cresta (1998): Size structure, relative growth and sanitary condition of a crayfish population (*Austropotamobius pallipes*) living in rocky pools (Crustacea, Decapoda). – Spixiana **21/2:** 135-144

Bio-ecological aspects of a crayfish population inhabiting two rocky pools in the Carpasina stream (Liguria Region, N.W. Italy) were investigated per three years. A different spatial distribution between young and adult individuals was observed: juveniles were found under stones in shallow water, while large individuals were commonly found in deep water and in burrows present at the bottom of the pools. Length-frequency analyses showed that males are bigger than females. The sex-ratio was estimated at 1:1. Morphological variations related to sexual maturity were analysed in both sexes. Size at sexual maturity, based on allometric growth of the abdomen and chela width, was estimated at approximately 19 mm CL for both sexes. The male chelae, however, showed a further step at about 28 mm CL, indicating the existence of one third kind of male. The adaptative value of the three different kinds of males was discussed in terms of phisiological and morphological efficiency. Morphological analysis of the chelae indicated that both sexes begin their life as homochelids, but in the course of the life cycle they may lose their chelae. This seem to be related to the frequent intraspecific aggressions due to the limited space that the rocky pools offer to the species. A scarce number of crayfish was found affected both by pathologies than by branchiobdellids.

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Introduction

The biology of different European populations of *Austropotamobius pallipes* (Lereboullet) has been well studied (see for a general review Alderman & Polglase 1988, Laurent 1988, Lowery 1988). On the contrary, in Italy little has been done on the biology of *A. pallipes* (Ninni 1865, Mazzarelli 1903, Vinciguerra 1899, Supino 1925), nevertheless there has been a recent interest on this species (Mori et al. 1988, 1991, Specchi et al. 1991, De Luise 1991, Salvidio et al. 1993).

In Liguria (north-western Italian administrative Region) the freshwater crayfish populations are still widespread both in Alpine and Apennine water courses (Salvidio et al. 1993). In this region the

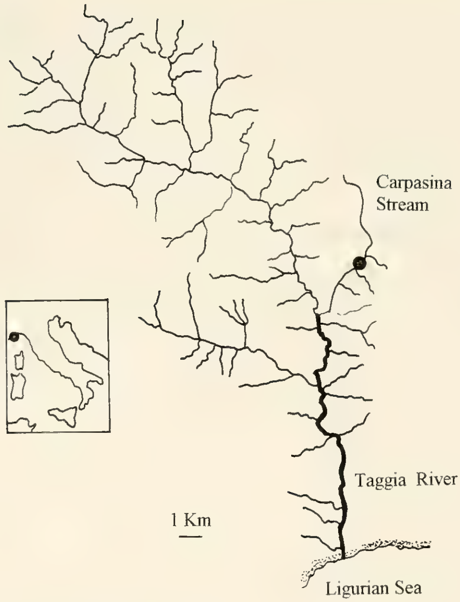

Fig. 1. Geographical location of the Carpasina stream.

crayfish are mainly distributed along the stream beds, but it is also possible to find them inside isolated rocky pools, mainly in those streams that present a steep gradient. The rocky pool environment could be characterised by fluctuations in a number of physo-chemical factors. No studies have been performed on the populations inhabiting these peculiar environments.

So we have conducted a study on a population of the crayfish *A.pallipes* inhabiting two rocky pools located in the Carpasina stream (Province of Imperia, N.W. Italy) with the aim to follow the temporal variation of its demographic structure and to estimate some of its biological parameters useful for a rationale utilisation and management of the species.

Materials and Methods

Fieldwork was conducted in the Carpasina stream (560 m above sea level), tributary of Taggia river, located in the Imperia Province (western Liguria, Italy) (Fig. 1). The study was performed along a transsect constituted by two rocky pools, followed by terraces, of a total length of about 42 m, the width ranging from 10 to 2.8 m and a maximum depth of 3 m (Fig. 2).

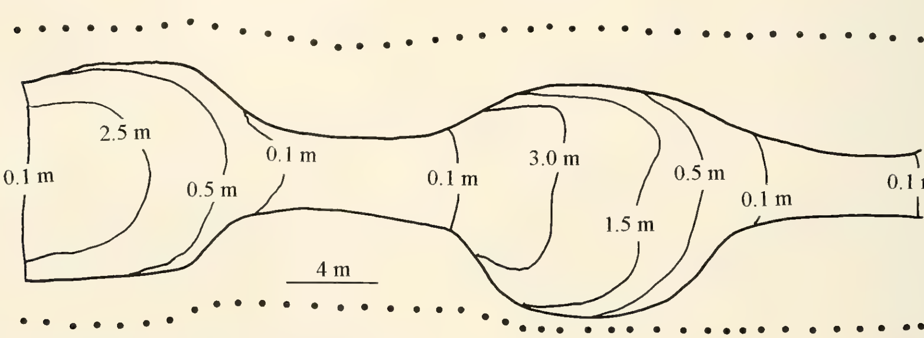

Fig. 2. Bathymetric map of the Carpasina stream.

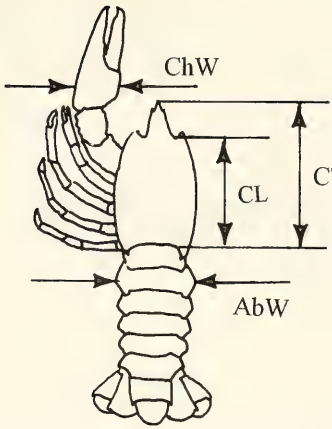

Fig. 3. *Austropotamobius pallipes:* measurements used to analyze relative growth. CL: carapace length; CT: cephalothorax length; AbW: abdomen width; ChW: chelar propodus width.

In this stream the postlarvae of *A. pallipes* are present from May to July. In order to sample all life stages, the crayfish population was inspected regularly once a year, during summer months (July-August) from 1993 to 1995. Crayfish were caught in the shallow water by manual sieving, while in deep water (>1 m) by diving. Once recorded the following parameters as sex, morphometric measurements, morphology of the chelae, external disease condition, scars and mutilation, the individuals were released.

Sex was readily identified from the morphology of the pleopod structures in individuals greater than 6 mm CL. Individuals smaller of this size were instead assigned as 50 % to the males and to the females, supposing that the primary sex ratio is unbiased.

In order to evaluate the external disease conditions and the morphological abnormalities of the population under examination, each individual was carefully inspected by use of a magnifying glass (3×).

The following morphometric measurements were also made on each specimen, using vernier callipers to the nearest 0.1 mm (Fig. 3): (CL) carapace length, from the eye socket to the mind-posterior margin of the carapace; (CT) cephalothorax length, from the tip of the rostrum to the mind-posterior margin of the carapace; (ChW) width of the chelar propodus; (AbW) width of the second abdominal segment. The body wet weight (WW) of each specimen was also recorded to the nearest 0.1 g by means of a Pesola dynamometer.

Relative growth was described using the traditional Model I regression equation for allometric growth: $\log Y = \log a + b \log X$ (Sokal & Rohlf 1981). Data were analysed after log-transformation with carapace length (CL) chosen as the main reference dimension. Allometry was determined by testing the slope of the regressions against the isometric slope of 1 with Student's t-test. Statistical equality of morphometric relationships between sexes, and among maturity instars were tested using ANCOVA, carried out by using BIOM-pc (Rohlf 1989).

Results

Population structure and Sex-ratio

Males were distributed between 3.5 and 40 mm CL and females between 3.5 and 32 mm CL (Fig. 4). The number of crayfish recorded showed a decrease from year to year, above all at the medium size. The distribution frequency of CL was significantly different in three years, above all considering males plus females (Tab. 1).

Annual sex-ratio was not found significantly different from 1:1, with the exception of July 1993, when, because of an insufficient sampling on the pool bottoms caused by a rupture of a aqualung, the proportion of males was 38.5 % (Fig. 4). The sex-ratio of crayfishes <22 mm CL was not significantly

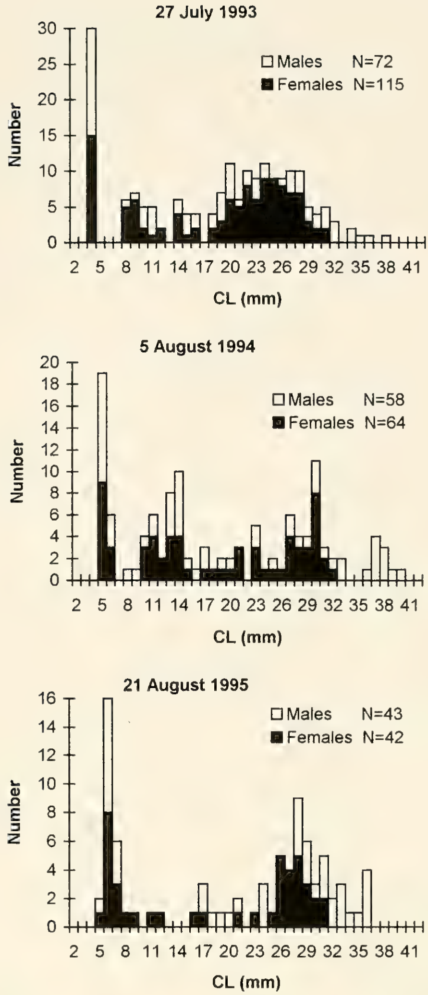

Fig. 4. Size (CL) frequency distributions of males and females of *Austropotamobius pallipes* collected and measured during the whole study performed in Carpasina stream (Liguria, N. W. Italy).

different from unity; females were significantly more numerous than males among 22-28 mm, and males dominated size classes >32 mm (Fig. 5).

Crayfish smaller than 13 mm CL were only found in shallow waters among in the riparian vegetation and under stones.

Tab. 1. Results of the Kolmogorov-Smirnov analysis (Siegel 1956) to test the null hypothesis that there is no difference in the size distribution of crayfish with year. Level of statistical significance: *: $p<0.05$; **: $p<0.01$; ns: no significance.

	Males + Females		Males		Females	
variables	D	*P*-level	D	*P*-level	D	*P*-level
1993 vs. 1994	0.178	*	0.182	ns	0.184	ns
1993 vs. 1995	0.265	**	0.261	ns	0.268	*
1994 vs. 1995	0.211	*	0.199	ns	0.262	ns

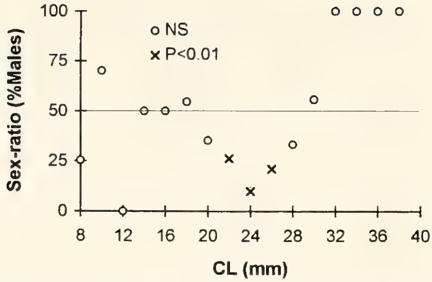

Fig. 5. Sex-ratio in relation to carapace length, recorded in 1993 (data grouped upon 2 mm intervals of CL).

Relative growth

The values of relative growth parameters of each morphometric character against carapace length estimated for overall males and females are given in Tab. 2. All correlation coefficients are high and significant ($P<0.01$). Negative allometric growth of cephalothorax length and of body wet weight both versus CL were revealed (Tab. 2) with no difference between males and females (Tab. 3). On the contrary a positive allometry either of the abdomen or of the chelae versus CL was revealed in both sexes (Tab. 2), but the former is larger in females than in males, while the chelae are larger in males than in females (Tab. 3).

As males and females increase in size certain of the body proportions change relative to CL. The width of the abdomen and chelar propodus plotted on a log-log scale against carapace length showed a change in the level of allometry, in both sexes, at about 19 mm CL (Fig. 6 and Tab. 2). The covariance analysis yielded significant differences between the different phases (Tab. 3). In the males, however, the growth of chelar propodus is more complex being it is triphasic, i.e., the regression line "broke" also at about 28 mm Cl. (Fig. 6 and Tab. 3). The covariance analysis yielded significative differences among

Tab. 2. Values of relative growth parameters of each morphometric characters againt carapace length, estimated either for overall males and females or for different maturity instars of each sex. AbW: Abdomen width; ChW: Chela width; CT: Cephalothorax length; WW: Body wet weight; N: Number of individuals; Se: Standard error of the slope; r: Correlation coefficient; *t*: H_0 for *t*-test, b=1 (b=3 per WW); As: Allometric status; +: Positive allometry (+: $p<0.05$; ++: $p<0.01$); 0: Isometry; –: Negative allometry.

Measures/CL	Sex	N	CL range	intercept (Log a)	slope (b)	Se	r	*t*	As
LogAbW	Females	160	3-31	-0.4020	1.1778	0.011	0.993	16.14	++
	Immature	45	3-20	-0.2931	1.0568	0.026	0.986	2.15	+
	Mature	115	19-31	-0.4814	1.2377	0.035	0.956	6.66	++
	Males	84	3-40	-0.2722	1.0315	0.011	0.995	2.84	++
	Immature	36	3-20	-0.3217	1.0805	0.022	0.993	3.57	++
	Mature	48	19-40	0.0155	0.8351	0.028	0.974	5.73	–
LogChW	Females	117	3-31	-0.7874	1.2568	0.019	0.985	12.91	++
	Immature	35	3-20	-0.6556	1.1182	0.049	0.972	2.40	+
	Mature	82	19-31	-0.6895	1.1900	0.060	0.906	3.12	++
	Males	112	3-40	-0.7543	1.2793	0.016	0.990	16.47	++
	Immature	38	3-20	-0.6463	1.1678	0.015	0.996	10.56	++
	SubMature	38	19-32	-0.0434	1.0343	0.084	0.899	0.40	0
	Mature	36	28-40	-0.9683	1.4467	0.121	0.899	3.68	++
LogCT	Females	132	3-31	0.1803	0.9525	0.004	0.998	10.82	–
	Males	85	3-40	0.1813	0.9523	0.003	0.999	12.62	–
LogWW	Females	207	3-31	-2.9235	2.8150	0.023	0.992	7.86	–
	Males	157	3-40	-2.9769	2.8686	0.029	0.991	4.39	–

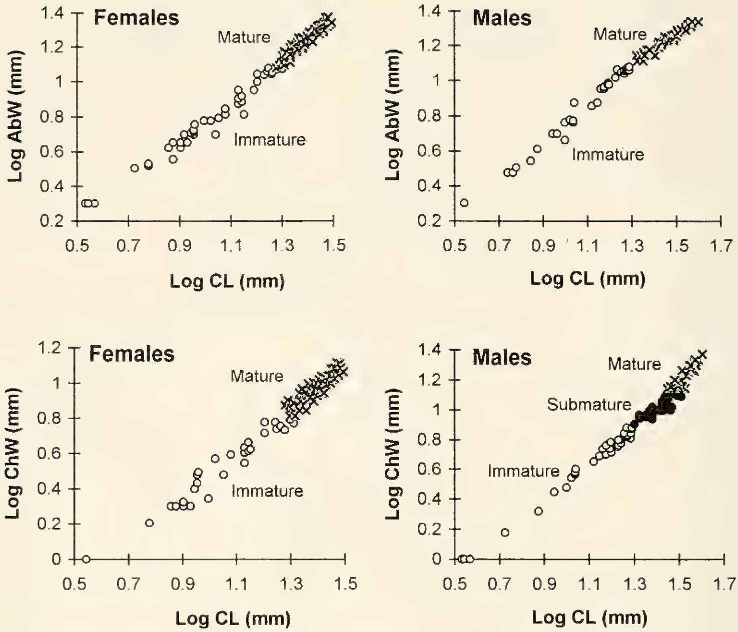

Fig. 6. Relationships among log morphometric dimensions and log carapace length, separated per maturity instars, for both sexes of *Austropotamobius pallipes*.

three male maturity instars (Tab. 3). No significant change in growth of the cephalotorax length and the body weight were detected in both sexes (Tab. 3).

Chelae morphology and pathologies

The percentage of males with homochelous, regenerated or missing chelae did not differ significantly in the three years of our study ($c^2 = 7.32$, df $= 4$, $P > 0.01$), as well as the females ($c^2 = 9.52$, df $= 4$,

Tab. 3. Comparison between male and female, and maturity instar log-log regression equations of each morphometric variable over CL, using ANCOVA. M: Males; F: Females; IF: Immature females; MF: Mature females; IM: Immature males; SM: Submature males; MM: Mature males.

		Differences among slopes		Differences among adjusted means (intercepts)		
	Variables	*F*	*P*-level	Common slope	*F*	*P*-level
AbW/CL	M vs. F	81.87	<0.001	1.116	173.53	<0.001
	IF vs. MF	14.18	<0.001	1.085	36.63	<0.001
	IM vs. MM	26.73	<0.001	1.049	1.59	ns
ChW/CL	M vs. F	0.72	ns	1.271	125.57	<0.001
	IF vs. MF	0.80	ns	1.134	20.02	<0.001
	IM vs. SM vs. MM	0.28	ns	1.167	75.81	<0.001
CT/CL	M vs. F	1.14	ns	0.951	0.10	ns
	IF vs. MF	2.55	ns	0.951	0.01	ns
	IM vs. MM	10.7	ns	0.948	0.65	ns
WW/CL	M vs. F	1.47	ns	2.836	2.05	ns

Tab. 4. Percentage of individuals with homochelous, regenerated or missing chelae according to five different carapace length classes. M: Males; F: Females.

Size-range CL (mm)	Chelae										No examined	
	Homochelous		Regenerated				Missing					
			Left		Right		One		Two			
	M	F	M	F	M	F	M	F	M	F	M	F
4-13	89.4	90.6	2.1	1.9	2.1	3.8	2.1	3.8	4.3	0.0	47	53
14-19	90.0	77.8	5.0	0.0	5.0	1.1	0.0	0.0	0.0	11.1	20	18
20-25	66.7	63.0	11.1	22.2	16.7	7.4	5.6	3.7	0.0	3.7	18	54
26-32	68.6	63.3	20.0	18.3	8.6	8.3	2.9	10.0	0.0	0.0	35	60
33-40	68.2	–	13.6	–	4.5	–	13.6	–	0.0	–	22	–
Total	74.8	69.7	13.3	15.4	6.7	7.4	3.7	5.1	1.5	2.3	142	185

$P>0.01$). So, data from different years were pooled and separated according to five different carapace length classes (Tab. 4). Most crayfish of both sexes were homochelous in the smaller size classes. Their largest number with regenerated or missing chelae was found in larger classes. No difference in chelae morphology was detected between sexes ($P>0.05$). A scarce number of crayfish was found affected by scars and mutilations (fingers, antennae and pereiopods lacking) (Tab. 5).

A relatively small number of crayfish appeared affected by external pathologies (Tab. 6). *Branchiobdella* spec. was only recorded during the first year of investigation. These annelids have been always found on the ventral margin of the carapace and coxa of the legs. They range among 2 to 7 individuals per crayfish.

Discussion

Data obtained from catches performed at different depths in the stream indicate differences in the occupation of the habitat between large and small specimens of *A. pallipes.* Crayfish <13 mm CL were found only in the riparian vegetation or under stones in shallow water, whereas larger crayfish occurred at different depth or on the bottom of the pools. This distribution suggests that the first development of new-borns occurs in shallow waters and, after the first phase of their life cycle, they move to the main stream bed. Shallow waters are usually sheltered places, rich in organic deposition, where the young specimens are protected from predators and have a more suitable substratum in terms of feeding opportunities. Microhabitat changes related to predator pressure as well as feeding requirement seem also to be very common among fishes (Mazzoni & Caraschi 1995).

The annual decrease of the crayfish number observed during this study in the Carpasina stream is probably due to the poaching, because any natural predator of crayfish (brown trout, eel, bulhead, rat, and crow) was never observed in the area of study (S. Salvidio, data unpublished). Poaching is very frequent in Italy (Laurent 1988). In the rocky pools the illegal catching of crayfish seem to be principally addressed to the specimens of medium size because the crayfish of larger sizes, living on the bottom, can be only collected by diving.

Tab. 5. Frequency (%) of pathologies, scars and mutilations over body surface.

Year	Pathology				Scars		Mutilation		Number	
	Branchiobdella sp.		Fungi							
	♂	♀	♂	♀	♂	♀	♂	♀	♂	♀
1993	2.7	4.3	0	1.4	0	3.6	0	2.7	22	115
1994	0	0	0	2.3	2.3	0	2.3	0	43	42
1995	0	0	1.7	1.5	1.7	0	0	3.1	38	64
Total	0.9	0.9	1.0	1.8	1.9	1.8	0.9	2.3	103	221

In the study population both the maximum size and the sex-ratio were similar to those found in populations inhabiting hill streams or brooks (Brown & Bowler 1978, Arrignon & Roché 1983, Almaça 1990, Mori et al. 1996). Thus, the rocky pools seem to offer sufficient energy to crayfish development. Imbalanced sex-ratio among older specimens can be due to different reasons. A possible mechanism limiting female size in decapods could be a lengthening of the moult interval compared with males, caused by the onset of reproductive activity, which, at least in Anomura and Brachyura, is restricted to the intermoult period (Micheli et al. 1991). Furthermore, both moulting and reproduction entail considerable energy demands (Gherardi et al. 1989). A further hypothesis is that it may be due to their high mortality rate, caused by the high cost of egg production. Probably, both these hypotheses are valid because *A. pallipes* living in oligotrophic habitats mainly feeds on detritus (Reynolds 1979). According to Momot et al. (1978) the detritus, that consists of decomposing plant and animal fragments, and associated micro-organisms, i.e. bacteria, fungi, algae and protozoans, accounts for some 13.2-21.6 per cent by weight of total food consumed by natural crayfish population. However, whether the microbial organisms are or are not a sufficient source of energy for macrobenthic populations is still a subject open to discussion (Cammen 1989).

Employing CL as a reference dimension, this study has demonstrated that the cephalothorax length and the body weight are growing with a negative allometry and that no significant change in growth of these dimensions were detected in both sexes. The growth in width of the abdomen and of the chelar propodus instead demonstrates, in addition to the already demonstrated sexual dimorphism (Rhodes & Holdich 1979, Thomas 1981), marked allometric steps within each sex.. The first distinct alteration in growth of these dimensions at a CL of about 19 mm suggests a moult of puberty (sensu Pérez 1929), which demarcates the immature from mature phase. These results are in agreement with the smallest ovigerous females collected by Mori et al. (1988) in other streams of Liguria. The males presented a further step at about 28 mm CL, for that they may be separated in three different stages, i.e. in immature, submature and mature individuals. We have not performed any hystological study to confirm this subdivision, however, three kinds of males has been already described in a different number of decapod species (Hartnoll 1982, Micheli et al.,1990, Mori et al. 1996). So, on the basis of these studies, it is possible to hypothesise that the immature males are physiologically immature individuals, the submature males are physiologically mature individuals (i.e. they have functional gonads) but morphometrically immature individuals to sustain agonistic interactions with the mature males that present bigger chelae than them. This pattern was not revealed by previous morphometric studies performed on *A. pallipes* (Rhodes & Holdich 1979, Lowery 1988, Mori et al. 1991). The morphometric changes seem to be related to hormonal changes (Cornier et al. 1992). However, whether physiological and morphological maturities are linked in *A. pallipes* is still unknown. For this reason, further studies to determine at which size *A. pallipes* reaches its physiological maturity are needed.

Various interpretations have been given because the males of the decapod crustaceans have larger and wider chelae than females (see Hartnoll 1982 and Vannini & Gherardi 1988). In some species the role of the chelae has been related to the feeding habits, but for *A. pallipes* it can be dismissed because this species is principally a detritus feeder. So, the chelae are mainly used by crayfish to capture and hold females during mating or in agonistic interactions for keeping or conquering a burrow. The high incidence of individuals with regenerated or lacking chelae (first pereiopods) indicates that intraspecific aggressions are frequent. Probably this is related to the limited space that the rocky pool offer to the species. Such combats, however, did not involve the body or other pereiopods because a small number of individuals with scars and mutilation was found.

Fungi were found in a small number of crayfish, but in this study only the external part of the crayfish body was inspected, while a much wider number of diseases may be recognised in the internal part of the crayfish body (Alderman & Polglase 1988).

Crayfish infested by branchiobdellids were only recorded during the first year of investigation, but their number has been probably underestimated because other branchiobdellid species can live inside the gill chambers (Alderman & Polglase 1988, Gelder et al. 1994) It is also possible that the branchiobdellids move inside and out of the gill chambers in relation to the light, because during an investigation performed in a streams of the Liguria we have recorded by day a lower number of crayfish infested by branchiobdellids than by night. Such a supposition seems to be confirmed by the position of the branchiobdellids, always recorded, during this study, on the ventral margin of the carapace and coxa of the legs. Also this subject poses question for future research.

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New species and new records of the genus *Scopodes* Erichson from western New Guinea

Second supplement to the "Revision of the genus *Scopodes* Erichson from New Guinea"

(Insecta, Coleoptera, Carabidae, Pentagonicinae)*

Martin Baehr

Baehr, M. (1998): New species and new records of the genus *Scopodes* Erichson from western New Guinea. Second supplement to the "Revision of the genus *Scopodes* Erichson from New Guinea" (Insecta, Coleoptera, Carabidae, Pentagonicinae). – Spixiana **21/2:** 145-158

Three species of the genus *Scopodes* from New Guinea are newly described: *Scopodes hornabrooki,* spec. nov. from Papua New Guinea, and *Scopodes perignitus,* spec. nov. and *S. interruptus,* spec. nov., both from western New Guinea (central Irian Jaya). The male genitalia of *Scopodes amplipennis* Baehr are described and figured fot the first time. New records of *Scopodes adonis* Darlington, *S. atricornis* Baehr, *S. aspericollis* Baehr, *S. chimbu viridans* Baehr, *S. darlingtoni* Baehr, *S. foveipennis* Baehr, *S. minor* Baehr, *S. muliae* Baehr, *S. violaceus* Baehr, *S. wei* Bell & Bell, and *S. wilsoni* Darlington are dealt with. *Scopodes adonis* and *S. minor* are now known also from Japen Island and *S. adonus* is also recorded for central Papua New Guinea.

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Introduction

Within a sample of Carabidae collected by A. Riedel (München) during his most recent trip to central Irian Jaya (western New Guinea) two new species of the genus *Scopodes* were included as well as a new record of *S. muliae* Baehr and the hitherto unknown male of the recently described *S. amplipennis* Baehr. The new species and the ♂ genitalia of *S. amplipennis* are herein described.

Within material recently collected in Irian Jaya by P. Schüle and P. Stüben (Düsseldorf) three *Scopodes* species were included (*S. violaceus* Baehr, *S. adonis* Darlington, and *S. atricornis* Baehr) that markedly enlarge the known range of at least two of them. Especially the records of *S. adonis* from Japen Island and central Papua New Guinea are noteworthy, because this species thus far was assumed to possess a rather restricted range.

Carabid material collected almost thirty years ago mainly in Papua New Guinea by R. W. Hornabrook though only recently received for identification yielded several *Scopodes* species including a new one and material of some species decribed recently by me. Some of the new records again enlarge the known range of several species and are thus also worth noting.

* In parts results of the entomological collections of A. Riedel in New Guinea 1996.

As mentioned in previous papers (Baehr 1994, 1995) the genus *Scopodes* is extremely diverse and numerous in terms of species in New Guinea, and apparently many species are restricted to rather limited areas. This is surprising, because all known species (except for the high altitude species *S. altus* Darlington) apparently belong to one stock and may even have been derived from a single ancestor. The extremely fragmentated highlands that run through the whole of New Guinea presumably have supported the rapid evolution of these predominantly montane beetles and also are responsible for the high degree of local endemism. Hence, the prediction that more (perhaps many more) species will be detected in future, seems not too bold.

The types of the new species collected by A. Riedel are presented to the Zoologische Staatssammlung, but are stored as permanent loan in the reference collection of the author (ZSM-CBM). The holotype of *S. hornabrooki*, spec. nov. is stored in the Museum of New Zealand, Wellington (MNZ), the paratypes are shared between MNZ and the working collection of the author (CBM).

All measurements and ratios were obtained in the same manner as in the revision (Baehr 1994) and the first supplement (Baehr 1995).

The species

Scopodes chimbu viridans Baehr
Fig. 9

Baehr, 1995, p. 113, fig. 9.

This vividly coloured subspecies of *S. chimbu* Darlington was only known from the type locality near Kainantu, central eastern Papua New Guinea. Apart from an additional specimen from central Papua New Guinea, there are now records from central Irian Jaya, that establish a much wider range of this subspecies.

Variation. The specimens from Irian Jaya generally are slightly larger than the eastern ones, but apart from this little variation has been noted.

New records: 1♀, Marawaka, Eastern Highlands, New Guinea, R. Hornabrook, May 74 (MNZ); 1♂, Pangia, Southern Highlands, Papua New Guinea, 15.6.75, R. Hornabrook (CBM); 1♂, 3♀♀, Irian Jaya, Indonesia, Pass Valley, 2200 m, Baliem Valley, 20.8.92, R.W. and C.W. Hornabrook (MNZ); 1♂, Irian Jaya, Panai-Pr. Sinak-Ilaga, 2100-2500 m, 15.12.1995, leg. A. Riedel (CBM).

Scopodes muliae Baehr

Baehr, 1995, p. 113, figs 1, 5, 9.

This species was described from the ♂ holotype only. A second, somewhat defect ♂ (aedeagus wanting) was now obtained and is alluded to this species by means of body shape, colouration, structure of frontal sulci and transverse pronotal ridges, and microstructure of elytra. In all mentioned characters, the additional specimen does not vary substantially from the holotype.

New record: 1♂, IRIAN JAYA, Panai-Pr. Bilogay, 2100-2200 m, 29.XII.1995, leg. A. Riedel (CBM).

Distribution. The new record does not much enlarge the known distribution of this species that was recorded so far from the type locality only.

Scopodes aspericollis Baehr

Baehr, 1994, p. 109, figs 6, 33, 56.

This characteristic species was thus far recorded from the vicinity of Wau in central eastern Papua New Guinea. Two records from the Eastern Highlands slightly enlarge the range of this species to the west.

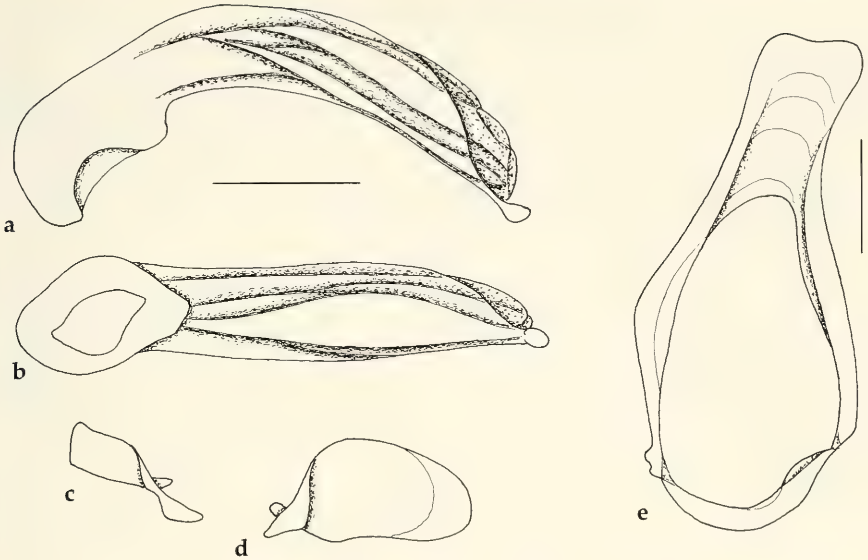


Fig. 1. *Scopodes amplipennis* Baehr. ♂ genitalia. **a.** Lateral view of aedeagus. **b.** Lower surface of aedeagus. **c.** Right paramere. **d.** Left paramere. **e.** Genital ring. Scale: 0.25 mm.

New records: 1♂, Marifuanga, 19.3.71, Asaro-Chimbu-Divide, New Guinea, R. Hornabrook (MNZ); 1♂, Frisano, Okapa, Eastern Highlands, New Guinea, 15.7.1972, R. Hornabrook (MNZ).

Scopodes amplipennis Baehr
Fig. 1

Baehr, 1995, p. 116, figs 2, 6, 9.

This species was described from the ♀ holotype only. Because some ♂ specimens have been recently collected, parts of the description are extended and completed.

Extended description
Measurements. Length: 3.45-3.55 mm; width: 1.5-1.55 mm. Ratios. Width head/pronotum: 1.25-1.29; width/length of pronotum: 1.20-1.23; width elytra/pronotum: 1.86-1.89; length/width of elytra: 1.19-1.22.

Colour. Bronzed-black, head and pronotum with distinct greenish lustre, elytra with greenish-golden lustre, or completely bright green.

♂ genitalia (Fig. 1). Genital ring somewhat deformed, asymmetric, fairly narrow. Apex very wide, rectangular, arms moderately wide. Aedeagus large, fairly curved, slightly asymmetric, lower surface rather concave, apex short, knob-like. Orificium fairly short. Parameres large.

Variation. The three newly recorded specimens vary from the holotype mainly by colour which is bright green instead of bronzed with greenish-golden lustre.

Collecting circumstances. Collected by beating from fallen log.

New records: 1♂, 1♀, Irian Jaya, Panai-Pr. Sinak-Ilaga, 2100-2500 m, 15.12.1995, leg. A. Riedel (CBM); 1♂, Irian Jaya, Panai-Pr. Sinak, 2000-2200 m, 14.-17.12.1995, leg. A. Riedel (CBM).

Distribution. This species is thus far restricted to a small area in central Irian Jaya.

Scopodes wei Bell & Bell

Bell & Bell, 1989, p. 160; Baehr 1994, p. 112, figs 8, 57.

This characteristic species was so far known only from the type locality near Wau, eastern central Papua New Guinea. Two new records slightly enlarge the range of this species to the west.

New records: 1♂, Daulo Pass, 11.9.71, Asaro-Cimbu-Divide, New Guinea, R. Hornabrook (MNZ); 1♀, Marifuanga, 23.10.71, Asaro-Cimbu-Divide, New Guinea, R. Hornabrook (MNZ).

Scopodes foveipennis Baehr

Baehr, 1994, p. 116, figs 11, 37, 60.

A very characteristically coloured, widespread species. An additional record from Papua New Guinea falls within the recorded range.

New record: 1♀, Frisano, Okapa, Eastern Highlands, New Guinea, 1.7.1972, R. Hornabrook (MNZ).

Scopodes wilsoni Darlington
Fig. 9

Darlington, 1968, p. 200; Baehr, 1994, p. 119, figs 13, 39, 61.

This species was so far known only from northern and eastern central Papua New Guinea. Several new records enlarge the range to the west into the Western Highlands of Papua New Guinea.

New records: 3♂♂, 2♀♀, Kassem Pass, E. Highlands, New Guinea, Sept. 71, R. Hornabrook (CBM, MNZ); 1♂, same locality, 29.9.72 (MNZ); 1♀, Karamui, Chimbu Dist. , New Guinea, 3500', March 1966, R. W. Hornabrook (MNZ), 2♂♂, ♀, Kwiop, 1.5.70/ Jimi Valley, Western Highlands, N.E. New Guinea, R. Hornabrook (MNZ); 1♂, 2♀♀, Kwima, 30.4.70/ Jimi Valley, Western Highlands, N.E. New Guinea, R. Hornabrook (MNZ); 1♂, 1♀, Marawaka, Eastern Highlands, New Guinea, R. Hornabrook (MNZ).

Scopodes darlingtoni Baehr

Baehr, 1994, p. 122, figs 15, 41, 62; 1995, p. 112.
Scopodes basalis Darlington, 1968, p. 200 (nom. praeocc.).

The species ranges over large parts of Papua New Guinea. Two new records fall within the known range.

New records: 1♀, Kwiop, 1.5.70/ Jimi Valley, Western Highlands, N.E. New Guinea, R. Hornabrook (MNZ); 1♀, Lufa, 27.4.74, Mt. Michael, New Guinea, R. Hornabrook (MNZ); 1♀, Okapa, Eastern Highlands, New Guinea, Sept. 1971, R. Hornabrook (CBM).

Collecting circumstances. The specimen from Lufa was caught "in wood chips".

Scopodes minor Baehr
Fig. 9

Baehr, 1994, p. 131, figs 21, 47, 60; Baehr 1995, p. 112.

The species has a scattered distribution in both parts of New Guinea. The new records verify the occurrence of this species also on Japen Island.

New records: 2♀♀, Garaina, Morobe District, N.E. New Guinea, R. Hornabrook (MNZ); 37♂♂♀♀, West Papua, Japen, Serai nach Ambeidiru, km 9, 1000 m, 5.8.1996, leg. Schüle/Stüben (CBM, ZSM); 1♂, 2♀♀, West Papua, Japen, Ambeidiru, 1000m, 6.-10.8.1996, leg. Schüle/Stüben (CBM, ZSM); 1♀, West Papua, Nabire nach Mapia,

km 54, 700 m, 23.7.1996, leg. Schüle/Stüben (ZSM); 1♀, Irian Jaya, Jayawijaya-Pr. Yalmabi, 1200-1400 m, 8.X.1996, leg. A. Riedel (CBM).

Collecting circumstances: The specimens from Japen island were collected in "Primärwald", "Sek.Wald/Busch", and in "Garten" which means in "primary forest", "secondary forest to bush", and "garden".

Scopodes violaceus Baehr

Fig. 9

Baehr, 1994, p. 137, figs 26, 52, 63.

This species was described from an area in eastern central Irian Jaya rather close to the Papuan border. There are now two new records from western central Irian Jaya, demonstrating that this species (like some others) is in fact more widely distributed along the central mountain ranges.

New records: 1♀, West Papua, Nabire nach Mapia, km 54, 700 m, 23.7.1996, leg. Schüle/Stüben (ZSM); 1♀, West Papua, Nabire nach Mapia, km 177, Ugida 1400 m, 29.7.1996, leg. Schüle/Stüben (ZSM).

Collecting circumstances. The first new record is from "Sek.wald/Busch" (secondary forest) at remarkably low altitude.

Scopodes adonis Darlington

Fig. 9

Darlington, 1968, p. 201; Baehr 1994, p. 140, figs 28, 54, 63.

This very peculiar species was thus far known only from the Torricelli Mts. and the Denake Range in the northern part of Papua New Guinea, and it appeared to be a rather locally ranging species. The more interesting is the new record from Japen Island (below) that markedly enlarges the range of this species to the west, but actually is in conformity with the paleogeographic conditions along the northern montane margin of New Guinea. Additional new records of this species from the Western Highlands of Papua New Guinea, however, are evidence of a far wider distribution that contradicts the opinion that this is a species of the northern margin of New Guinea.

New records: 1♂, Japen, Sarui nach Ambeidiru, km 9, 1000 m, 5.8.1996, leg. Schüle/Stüben (ZSM); 2♂♂, 1♀, Karimui, New Guinea, 3.73, R. Hornabrook (CBM, MNZ); 5♂♂, 4♀♀, Singaropa 24.4.70/Jimi Valley, Western Highlands, N.E. New Guinea, R. Hornabrook (CBM, MNZ).

Collecting circumstances. The specimen from Japen Island was collected at moderate altitude and in "Primärwald" which means virginal rain forest.

Scopodes hornabrooki, spec. nov.

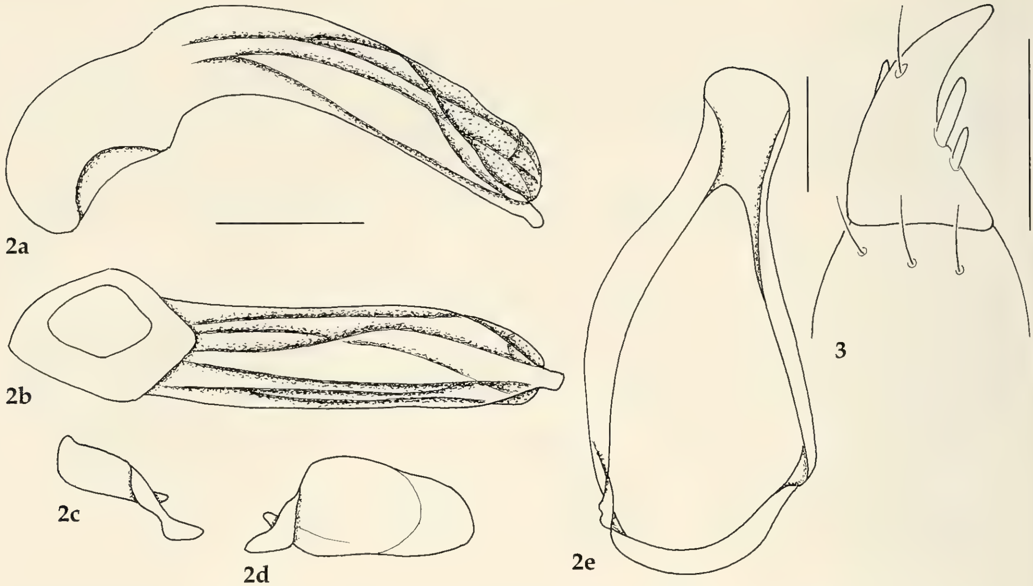
Figs 2, 3, 6, 10

Types. Holotype: ♂, Mt. Michael, Frisano, Eastern Highlands, New Guinea, R. Hornabrook, 28/12/74 (MNZ). – Paratypes: 2♀♀, same data (CBM, MNZ).

Diagnosis. Small, short and very wide, cupreous species with posteriorly even markedly widened elytra, large, rather contrasting, blue elytral foveae, and yellow legs and yellow antennae. Further distinguished from related species by complete elytral striation and absence of an additional elytral pore at the basis of the 5th stria.

Description

Measurements. Length: 3.0-3.4 mm; width: 1.4-1.6 mm. Ratios. Width head/pronotum: 1.22-1.27; width/length of pronotum: 1.25-1.28; width elytra/pronotum: 1.80-1.87; length/width of elytra: 1.20-1.23.



Figs 2, 3. *Scopodes hornabrooki*, spec. nov. **2.** ♂ genitalia. For legends see fig. 1. **3.** ♀ genitalia: stylomere 2 and apex of stylomere 1. Scale: 0.1 mm.

Colour. Coppery, lateral margins of head, pronotum, and elytra with greenish tinge. Labrum piceous-black, clypeus greenish-black. Antenna yellow, faintly darkened towards apex. Legs light yellow, apices of tarsomeresdark.

Head. Eyes large, space between inner border of eyes slightly wider than diameter of eye. Labrum rather short and wide, gently triangular, anterior border fairly convex, 6-setose, in basal part medially impressed. Clypeus with shallow, transverse sulcus, basal part irregularly striate, glossy. Labrum, clypeus, and anterior part of frons with some very inconspicuous additional hairs. Anterior triangular field of frons more or less wrinkled, rather glossy. Frons between eyes with c. 7 deep, rather straight, more or less irregular sulci that reach far posteriorly. Summit and neck coarsely wrinkled, impunctate. Whole upper surface of head rather smooth, glossy. Antenna short, median segments c. 1.1 × as long as wide.

Pronotum. Convex, wide, rather trapezoidal, widest at lateral triangular process in anterior third. Lateral border line distinct. Margin anteriorly convex, posterior of triangular process almost straight, in front of posterior angles not concave. Lateral triangular process distinct, though rather small, triangular, laterally rather projecting. Posterior marginal seta absent. Anterior margin slightly convex, posterior margin straight. Median line distinct, fairly deep, not reaching apex nor base. Transverse sulcus in apical third barely visible. Whole upper surface with coarse, rather dense, in posterior part fairly regular transverse sulci. Surface almost without puncturation, without microreticulation, fairly smooth, glossy.

Elytra. Very short and wide, moderately convex. Base comparatively narrow, elytra markedly widened towards apex, widest in apical third. Sides strongly rounded, in anterior third slightly excised. Apex rather wide, apical border oblique, distinctly sinuate. Surface striate throughout, though straition somewhat irregular. Foveae in third interval wide, moderately deep, rather contrasting. Surface rather uneven. Microrecticulation conspicuous, consisting of very dense, more or less transverse meshes that are remarkably irregular around the discal foveae. Surface with some sericeous lustre. Pilosity very sparse and short. Marginal pores comparatively large, contrasting. Wings short.

Lower surface. Metepisternum c. 1.3 × as long as wide. Abdominal sternites with extremely sparse and short pilosity, without distinct microreticulation. Terminal visible abdominal sternite with faint medial incision.

♂ genitalia (Fig. 2). Genital ring somewhat deformed, asymmetric, fairly narrow. Apex wide,

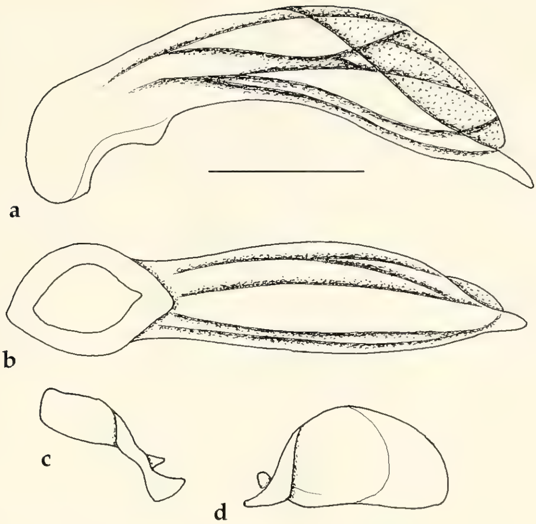


Fig. 4. *Scopodes perignitus,* spec. nov. ♂ genitalia. For legends see fig. 1.

rectangular, arms moderately wide. Aedeagus rather small and compact, fairly curved, slightly asymmetric, lower surface basally concave, in apical half straight, apex short, slightly knob-shaped. Orificium fairly elongate. Parameres large.

♀ genitalia (Fig. 3). Stylomere 2 medium-sized, rather curved, with dorsal ensiform and nematiform seta and with two ventral ensiform setae, namely a longer upper one and a shorter lower one. Apex of stylomere 1 with 3 elongate hairs. Lateral plate fairly densely setose.

Variation. In one of the ♀ paratypes elytral striation less deep, microreticulation less coarse, transverse sulci on pronotum and longitudinal sulci on head more regular, and anterior triangular field.of frons almost devoid of wrinkles.

Distribution (Fig. 10). Eastern Highlands of Papua New Guinea. Known only from type locality.

Collecting circumstances. Unknown.

Etymology. The name is a patronym in honour of the collector, R. W. Hornabrook.

Relationships. This species is closely related to *S. amplipennis* Baehr which – apart from body shape – can be seen also from the rather similar ♂ genitalia. However, perhaps *S. hornabrooki* is even more closely related to *S. perfoveatus*. Unfortunately, the ♂ genitalia of the latter species have not yet been recorded, but probably they will prove to be quite similar.

Scopodes perignitus, spec. nov.

Figs 4, 7, 10

Types. Holotype: ♂ (immat.), IRIAN JAYA, Jajawijaya-Pr., Pass between Kwiuwagi and Sinak, 3000 m, 3.I.1996, leg. A. Riedel (ZSM-CBM).

Diagnosis. Rather small, fairly elongate, bright coppery species with dark legs, rather wide, posteriorly widened elytra, large, rather contrasting, blue elytral foveae, and irregularly structured surface of the elytra with the striae deeply impressed only near base. Distinguished from related species by colouration and shorter apex of aedeagus.

Description

Measurements. Length: 3.55 mm; width: ?. Ratios. Width head/pronotum: 1.28; width/length of pronotum: 1.20; width elytra/pronotum: ?; length/width of elytra: ?.

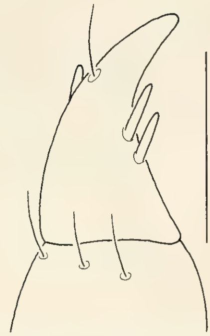


Fig. 5. *Scopodes interruptus*, spec. nov. ♀ genitalia: For legend see fig. 3.

Colour. Surface completely bright coppery. Labrum balck, clypeus coppery with greenish margins. Antenna black, basal antennomeres reddish on underface. Legs dark.

Head. Eyes very large, space between inner border of eyes slightly wider than diameter of eye. Labrum rather short and wide, gently triangular, anterior border fairly convex, 6-setose, in basal part medially impressed. Clypeus with shallow, transverse sulcus, basal part strongly striate, glossy. Labrum, clypeus, and anterior part of frons with some very inconspicuous additional hairs. Anterior triangular field of frons coarsely wrinkled. Frons between eyes with c. 6 coarse, irregular sulci that reach far posteriorly. Summit and neck coarsely wrinkled, impunctate. Whole upper surface of head smooth, glossy. Antenna short, median segments c. 1.1 × as long as wide.

Pronotum. Highly convex, rather wide, trapezoidal, widest at lateral triangular process in anterior third. Lateral border line distinct. Margin anteriorly convex, posterior of triangular process almost straight, in front of posterior angles not concave. Lateral triangular process distinct, though small, triangular, laterally moderately projecting. Posterior marginal seta absent. Anterior margin slightly convex, posterior margin straight. Median line distinct, fairly deep, not reaching apex nor base. Without distinct transverse sulcus in apical third. Whole upper surface with rather dense, coarse, in posterior part regular transverse sulci. Surface almost without puncturation, without microreticulation, fairly smooth, rather glossy.

Elytra. Morderately elongate, moderately convex (though difficult to assess, because specimen rather fresh with somewhat shrunken elytra). Base comparatively narrow, elytra widened towards apex, widest in apical third. Sides strongly rounded, in anterior third somewhat excised. Apex rather wide, apical border oblique, slightly sinuate. Surface in basal fourth deeply striate, in posterior part striation superficial. Foveae in third interval rather wide, moderately deep, rather contrasting. Surface uneven. Microrecticulation rather superficial, consisting of very dense, transverse meshes that are remarkably irregular around the discal foveae. Surface with conspicuous, sericeous lustre. Pilosity very sparse and short. Marginal pores comparatively large, contrasting. Wings relatively elongate.

Lower surface. Metepisternum c. 1.4 × as long as wide. Abdominal sternites with extremely sparse and short pilosity, without distinct microreticulation.

♂ genitalia (Fig. 4). Genital ring barely sclerotized. Aedeagus fairly large, rather curved, slightly asymmetric, lower surface gently bisinuate, apex rather elongate, depressed, faintly turned down. Orificium fairly elongate. Parameres large.

♀ genitalia. Unknown.

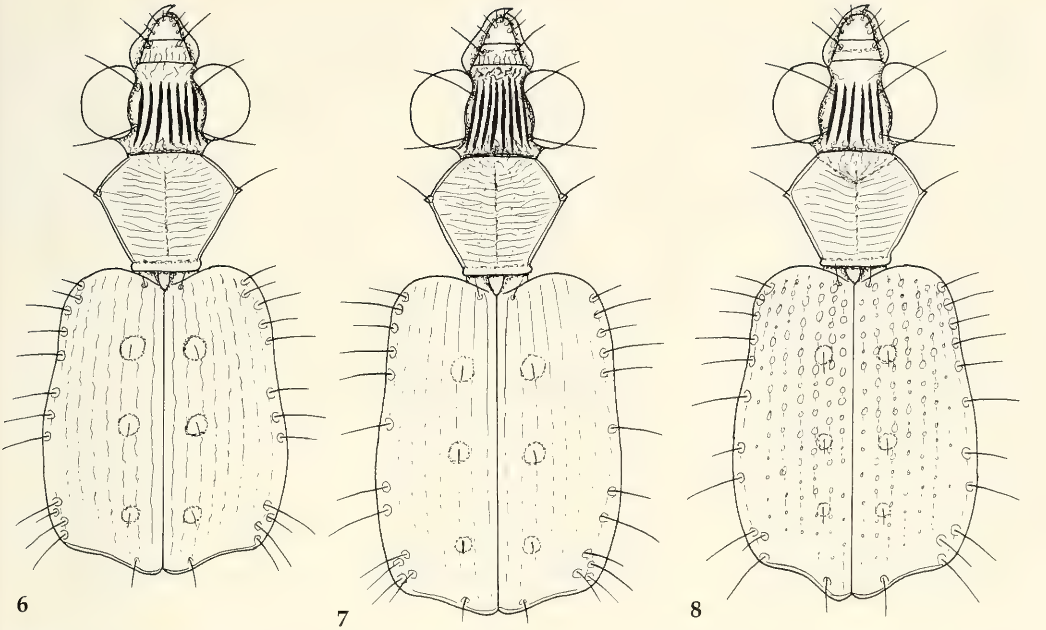
Variation. Unknown.

Distribution (Fig. 10). Central Irian Jaya. Known only from type locality.

Collecting circumstances. Largely unknown. Holotype collected at rather high altitude on track.

Etymology. The name refers to the bright red colour of the surface.

Relationships. This species belongs to the *chimbu*-group in a restricted sense and it is perhaps most closely related to *S. regularis* Baehr. Unfortunately, the male genitalia of the latter species are yet unrecorded, thus the exact position of *S. perignitus* remains to be fixed.



Figs 6-8. Habitus. **6.** *Scopodes hornabrooki*, spec. nov. **7.** *S. perignitus*, spec. nov. **8.** *S. interruptus*, spec. nov. Lengths: 3.0 mm; 3.55 mm; 3.5 mm.

Scopodes interruptus, spec. nov.

Figs 5, 8, 10

Types. Holotype: ♀, IRIAN JAYA, Panai-Pr., Mt. Doorman-Range N. Bilogay, 3000 m, 27.XII.1995, leg. A. Riedel (ZSM-CBM).

Diagnosis. Rather small, short and wide, coppery-bronzed species with remarkably glossy surface, piceous legs, moderately wide, posteriorly little widened elytra, blue, though not contrasting, elytral foveae, and irregularly structured surface of the elytra with markedly interrupted striae. Further distinguished by very short antenna, shallow, regular frontal sulci, and shallow tranverse pronotal sulci.

Description

Measurements. Length: 3.5 mm; width: 1.5 mm. Ratios. Width head/pronotum: 1.21; width/length of pronotum: 1.28; width elytra/pronotum: 1.80; length/width of elytra: 1.27.

Colour. Coppery-bronzed, lateral margins of head, pronotum, and elytra with faint greenish lustre. Labrum black. Antenna piceous, four basal antennomeres yellowish. Legs light piceous, tibiae even dark reddish.

Head. Eyes rather large, space between inner border of eyes slightly wider than diameter of eye. Labrum rather short and wide, gently triangular, anterior border fairly convex, 6-setose, in basal part medially impressed. Clypeus with distinct, transverse sulcus, basal with shallow striae, rather smooth, glossy, apical part markedly convex. Labrum, clypeus, and anterior part of frons with few extremely inconspicuous additional hairs. Anterior triangular field of frons not wrinkled, smooth, glossy. Frons between eyes with c. 6 shallow, straight, regular sulci that reach far posteriorly. Summit and neck coarsely wrinkled, impunctate. Whole upper surface of head smooth, very glossy. Antenna very short, moniliform, median segments slightly wider than long.

Pronotum. Rather convex, very wide, rather trapezoidal, widest at lateral triangular process in anterior third. Lateral border line distinct. Margin anteriorly convex, posterior of triangular process almost straight, in front of posterior angles not concave. Lateral triangular process distinct, though

Fig. 9. Revised distribution of *Scopodes chimbu viridans* Baehr: ■; *S. wilsoni* Darlington: ◆; *S. minor* Baehr: ▼; *S. violaceus* Baehr: ▲; and *S. adonis* Darlington: ●.

small, triangular, laterally fairly projecting. Posterior marginal seta absent. Anterior margin slightly convex, posterior margin straight. Median line distinct, deep, not reaching apex nor base. In apical third with rather deep and wide, transverse sulcus. Whole upper surface with rather coarse, moderately sparse, in middle shallow, fairly irregular transverse sulci. Surface almost without puncturation, without microreticulation, smooth, glossy.

Elytra. Moderately wide, fairly convex. Base comparatively wide, elytra little widened towards apex, widest in apical third. Sides rounded, in anterior third somewhat excised. Apex rather wide, apical border oblique, distinctly sinuate. Lateral and apical margins wide, conspicuous. Surface deeply striate throughout, though striae markedly interrupted and merely consisting of rows of large punctures. Foveae in third interval wide, rather deep, moderately contrasting. Surface markedly uneven. Microrecticulation absent from disk, present only near apex. Surface very glossy. Pilosity very sparse and short. Marginal pores comparatively large, rather contrasting. Wings fairly short.

Lower surface. Metepisternum c. 1.3 × as long as wide. Abdominal sternites with extremely sparse and short pilosity, without distinct microreticulation. Terminal visible abdominal sternite with rather distinct medial incision.

♂ genitalia. Unknown.

♀ genitalia (Fig. 5). Stylomere 2 medium-sized, rather curved, with dorsal ensiform and nematiform seta and with two elongate ventral ensiform setae. Apex of stylomere 1 with 3-4 elongate hairs. Lateral plate fairly densely setose.

Variation. Unknown.

Distribution (Fig. 10). Central Irian Jaya. Known only from type locality.

Collecting circumstances. Largely unknown. Holotype collected in rather high altitude by beating from moss-grown scrub.

Etymology. The name refers to the conspicuously interrupted elytral intervals.

Relationships. This is an outstanding species, not closely related to any of the known New Guinean species. Its actual position perahps will remain unsettled until the ♂ genitalia are recorded.

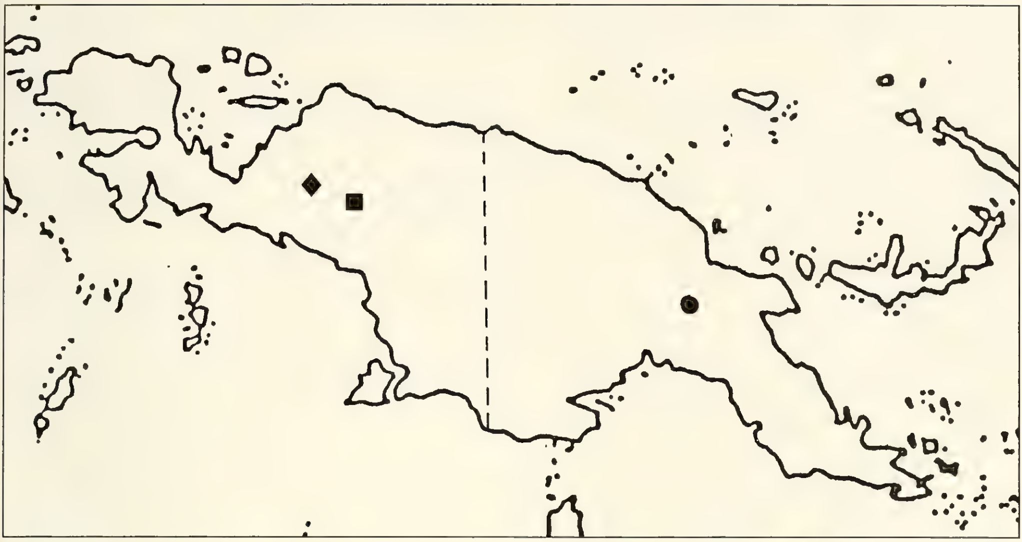


Fig. 10. Distribution of *Scopodes hornabrooki*, spec. nov.: ●; *S. perignitus*, spec. nov.: ■; *S. interruptus*, spec. nov.: ◆.

Recognition

Because of the several new taxa described in the 1st supplement (Baehr 1995) and in this 2nd supplement, the key to the species of the *chimbu-* and *violaceus*-groups is completely revised and should replace the keys in the 1st supplement as well as the first part of the general key in the revision (Baehr 1994). The latter key to couplet 15 included is replaced here by a completely new key. The couplet numbers of the second part of the key in the revision then must be changed from number 16 which will change to number 23 and so on. For the benefit of the user the figures of the revision and the 1st supplement are added as **BA94** fig. and **BA95** fig., respectively.

Revised key to the species of the *altus-*, *chimbu-* and *violaceus*-groups of the genus *Scopodes*

1. Prothorax with 2 setae each side, the posterior seta on conspicuous dentiform process; depressed, black species; elytra completely striate. Central Irian Jaya .... *altus* Darlington
– Prothorax with only 1 seta each side, in anterior third, without posterior-lateral seta and process .... 2.

2. Elytra with conspicuous, irregular, sericeous pattern or markedly microreticulate, extensively but irregularly striate; foveae in 3rd interval large, though shallow .... 3.
– Elytra without conspicuous sericeous pattern, microreticulation usually less marked, rather superficial or at all absent, striation variable, though usually less extensive; foveae in 3rd interval either large and deep, or very small and inconspicuous .... 18.

3. Foveae in 3rd interval more or less conspicuously blue; legs always uniformly yellow or light reddish .... 4.
– Foveae in 3rd interval not or but faintly blue; legs dark, at most tibiae reddish or light piceous, or uniformly light, in that case colour vividly cupreous or greenish-cupreous and aedeagus with wide, spatulate, laterally hooked apex .... 10.

4. Elytra very short and wide, ratio length/width c. 1.20, posteriorly remarkably widened (Fig. 6; **BA95** figs 2, 3); elytral striae at least in basal third coarse and deep .... 5.

– Elytra longer and less wide, ratio length/width >1.30, posteriorly barely widened, elytral striae in basal third fine and rather shallow as in posterior part .... 7.

5. Colour cupreous; transverse strioles of pronotum coarse and irregular; microreticulation of elytra very distinct; aedeagus with straight lower surface and with slightly knob-shaped apex, or unknown .... 6.

– Colour blackish-bronzed with greenish and purplish tinge; transverse strioles of pronotum less coarse, rather regular; microreticulation of elytra superficial; aedeagus with evenly concave lower surface and with short, markedly knob-like apex (Fig. 1). Central Irian Jaya ..... *amplipennis* Baehr

6. Antenna black, only basal antennomeres yellowish; elytral striae only in basal third deep, posterioly very shallow; besides the foveae at 3rd stria a setiferous fovea present in basal fourth of 5th stria (**BA95** fig. 3); aedeagus unknwon. Western Highlands of Papua New Guinea ... *perfoveatus* Baehr

– Antenna yellow throughout, at most slightly darker towards apex; elytral striae deep throughout; without additional fovea at 5th stria (Fig. 6); aedeagus with straight lower surface and with slightly knob-shaped apex (Fig. 2). Eastern Highlands of Papua New Guinea .... *hornabrooki*, spec. nov.

7. Smaller species (c. 3.5 mm); colour bronzed or somewhat greenish; antenna almost completely reddish, short, median segments c. as wide as long; frontal sulci fewer, c. 6; aedeagus with simple apex (**BA94** fig. 9). Eastern central Papua New Guinea .... *tafa* Darlington

– Larger species (>4 mm); colour either bright green, or bronzed without any green reflections, or cupreous, or pronotum and head green, elytra cupreous; antenna with 4 basal segments yellow, rest more or less contrastingly dark, longer, median segments distinctly longer than wide; frontal sulci more numerous, 8-9; aedeagus either with knob-like apex or simple, in latter case either colour bright green or microreticulation of elytra almost isodiametric. .... 8.

8. Colour completely bronzed; microreticulation of elytra feebly transverse or almost isodiametric; aedeagus rather straight, apex of ♂ genital ring elongate (**BA94** fig. 12). Eastern central Irian Jaya. .... *reticulatus* Baehr

– Colour bright green, or cupreous, or head and prothorax green, elytra cupreous; microreticulation of elytra markedly transverse; aedeagus rather convex, apex of ♂ genital ring short (**BA94** figs 10, 11) .... 9.

9. Colour always completely bright green; elytral foveae very contrastingly blue; aedeagus with simple apex (**BA94** fig. 11). Eastern central Papua New Guinea, eastern central Irian Jaya, Vogelkop, westernmost Irian Jaya .... *foveipennis* Baehr

– Colour completely cupreous or head and prothorax green, elytra cupreous; elytral foveae less contrastingly blue; aedeagus with knob-like apex (**BA94** fig. 10). Eastern central Papua New Guinea .... *viridiaeneus* Baehr

10. Femora yellow or light reddish .... 11.

– Femora dark .... 12.

11. Large, wide species with cupreous elytral suture; aedeagus with wide, spatulate, laterally hooked apex (**BA94** fig. 8). Central eastern Papua New Guinea .... *wei* Bell & Bell

– Smaller, narrower, uniformly greenish species without cupreous elytral suture; aedeagus with narrow, elongate, tapering apex (**BA95** fig. 5). Central Irian Jaya .... *muliae* Baehr

12. Smaller species, length <3.8 mm; antenna short, median antennomeres almost as wide as long; aedeagus (when known) without knob-like apex and without sharp lateral edge (Fig. 4; **BA94** fig. 3) .... 13.

– Larger species, length >4.0 mm; antenna longer, median antennomeres >1.3 × as long as wide; aedeagus with knob-like apex and/or with sharp lateral edge (**BA94** figs 4, 6, 7) .... 16.

13. Colour bright cupreous throughout; aedeagus with shorter, slighty downturned apex (Fig. 4). Central Irian Jaya .... *perignitus*, spec. nov.

– Colour green or blackish-bronzed; aedeagus with longer apex.(**BA94** fig. 3), or unknown, in latter case striation of elytra almost wanting except near base .... 14.

14. Frontal sulci parallel, markedly regular; antenna reddish throughout, only terminal antennomeres slightly darkened; striae of elytra almost wanting except near base; clypeus and labrum blackish-aeneous, contrastingly coloured; ♂ genitalia unknown. Eastern central part of Papua New Guinea .... *regularis* Baehr

– Frontal sulci less parallel and regular; antenna dark, only four basal antennomeres lighter; striae of elytra distint throughout; clypeus and labrum not contrastingly coloured; aedeagus with elongate, depressed apex (**Ba94** fig. 3) .... 15.

15. Colour green. Central Papua New Guinea, central Irian Jaya .... *chimbu viridans* Baehr

– Colour blackish-bronzed, head and pronotum with some greenish tinge. Eastern central Papua New Guinea .... *chimbu chimbu* Darlington

16. Colour plain green, only labrum blackish-green; elytra slightly shorter, ratio l/w 1.36; apex of aedeagus slightly knob-like, but without sharp lateral edge (**BA94** fig. 4). Northeastern Papua New Guinea .... *virescens* Baehr

– Colour cupreous, or blackish with dark greenish, bluish, or cupreous tinge; elytra more elongate, ratio l/w >1.4; lower surface of aedeagus laterally with sharp edge, apex more or less widened (**BA94** figs 6, 7) .... 17.

17. Antenna slightly shorter, median segments c. 1.3-1.4 × as long as wide, basal antennomeres less contrastingly coloured; ♂ genital ring laterally at apex excised (**BA94** fig. 6e); aedeagus shorter, more curved, laterally more sinuate, apex distinctly knob-like (**BA94** fig. 6). Eastern central Papua New Guinea .... *aspericollis* Baehr

– Antenna slightly longer, median segments almost 1.5 × as long as wide, basal antennomeres very contrastingly coloured; ♂ genital ring laterally at apex not excised (**BA94** fig. 7e); aedeagus longer, less curved, laterally less sinuate, apex not distinctly knob-like (**BA94** fig. 7). Eastern central Irian Jaya .... *cuprascens* Baehr

18. Pronotum without lateral margin, without lateral triangular process; elytra elongate and egg-shaped, apical margin deeply concave, inner angle acute; foveae in 3rd interval minute; aedeagus with depressed, laterally hooked apex (**BA94** fig. 28). Scattered throughout New Guinea, also on Japen Island .... *adonis* Darlington

– Pronotum with distinct lateral margin, with lateral triangular process; elytra wider, not egg-shaped, apical margin at most feebly concave, inner angle obtuse; foveae in 3rd interval large or, rarely, small; aedeagus different .... 19.

19. Foveae in 3rd interval small, barely visible; ♂ genitalia see **BA94** figs 26, 27; **BA95** fig. 8. .... 20.

– Foveae in 3rd interval always large and conspicuous; ♂ genitalia, when known, see **BA94** figs 13-15, 17-23, 25 .... 22.

20. Colour violaceous; apex of aedeagus not knob-like (**BA94** figs 26, 27) .... 21.

– Colour not violaceous, forebody greenish, elytra black with golden tinge; aedeagus ventrally striolate, apex slightly knob-like (**BA95** fig. 8). Central eastern Irian Jaya .... *balkei* Baehr

21. Foveae in 3rd interval usually smaller, barely visible; elytra almost non-striate; apex of aedeagus not lancet-shaped (**BA94** fig. 26); ♀ sternum VII without distinct notch in middle of apical margin. Central Irian Jaya .... *violaceus* Baehr

– Foveae in 3rd interval usually larger, well visible; elytra usually feebly striate; apex of aedeagus lancet-shaped (**BA94** fig. 27); ♀ sternum VII with distinct notch in middle of apical margin. Vogelkop, western Irian Jaya .... *riedeli* Baehr

22. Elytra deeply striate, though striae markedly interrupted and consisting of rows of irregular punctures (Fig. 10); antenna moniliform, median antennomeres wider than long; ♂ genitalia unknown. Central Irian Jaya .... *interruptus*, spec. nov.

– Elytra less striate, or striae not markedly interrupted and consisting of rows of irregular punctures; antenna usually longer, never moniliform .... 23.

23. = 16. of key in the revision (Baehr 1994).

Acknowledgements

I am pleased to express my thanks to Mr. A. Riedel, München, Dr. R. W. Hornabrook, Wellington, New Zealand, and Mr. P. Schüle, Düsseldorf, for kindly submitting their material for identification.

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Updated alphabetial checklist of the valid New Guinean species of the genus *Scopodes*

Since publication of my revision (Baehr 1994), altogether 7 new species and one additional subspecies have been described, hence an updated checklist of the presently known 35 New Guinean taxa is useful.

adonis Darlington, 1971
altus Darlington, 1971
amplipennis Baehr, 1995
aspericollis Baehr, 1994
atricornis Baehr, 1994
balkei Baehr, 1995
bicolor Baehr, 1994
caeruleus Baehr, 1994
chalceus Baehr, 1994
cheesmannae Darlington, 1971
chimbu chimbu Darlington, 1971
chimbu viridans Baehr, 1995
cuprascens Baehr, 1994
darlingtoni Baehr, 1994
foveipennis Baehr, 1994
hornabrooki, spec. nov.
interruptus, spec. nov.
laevifrons Baehr, 1994
minor Baehr, 1994
muliae Baehr, 1995
perfoveatus Baehr, 1995
perignitus, spec. nov.
regularis Baehr, 1994
reticulatus Baehr, 1994
riedeli Baehr, 1994
robustus Baehr, 1994
rufipes Baehr, 1994
striaticollis Baehr, 1994
tafa Darlington, 1971
tristis Baehr, 1994
violaceus Baehr, 1994
virescens Baehr, 1994
viridiaeneus Baehr, 1994
wei Bell & Bell, 1989
wilsoni Darlington, 1971

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Two new species of *Ranatra* from Brazil

(Insecta, Heteroptera, Nepidae)

Nico Nieser and **Ernst-Gerhard Burmeister**

Nieser, N. & E.-G. Burmeister (1998): Two new species of *Ranatra* from Brazil (Heteroptera, Nepidae). – Spixiana **21/2:** 159-163

Ranatra flokata, spec. nov., from Amazonas and *R. machrisi*, spec. nov. from Goiás are described and compared with similar species.

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Introduction

The interesting new species *Ranatra flokata* described below was collected 35 years ago by Dr. E. J. Fittkau in connection with Amazonian research in cooperation of the Max-Planck-Institute for Limnology and the Instituto Nacional de Pesquisas da Amazonia. As to our knowledge no further specimens have been found and the first author wants to include the species in his work on water bugs of Minas Gerais. It was decided to describe this species on the single specimen.

In addition a new species collected during the Machris Expedition of the Los Angeles County Museum to Goiás is described.

Ranatra Fabricius is a cosmopolitan genus with highest species density in South America (Nieser 1975). Most species hide between plants in quiet waters awaiting prey, but a few hide, at least occasionally, in mud on the bottom of the habitat as Nepinae do. The American species of *Ranatra* have been summarized by DeCarlo (1964). His identification key (DeCarlo 1973) is, however, difficult to use without reliable reference specimens. South American *Ranatra* are on the whole very uniform with scanty diagnostic characteristics (Lansbury 1974), the new Amazonian species is a pleasant exception on this rule.

Measurements are in mm.

Ranatra flokata, spec. nov.

Figs 1-8

Types: Holotype: ♂, BRASIL: Amazonien, Ig(arapé) Aduja, mitlerer Rio Negro, oberhalb des Rio Branco (Exkursion 4.-16. Feb. 1962), leg. E. Fittkau (Zoologische Staatssammlung, München).

Description

Measurements. Body length (without siphon) 45, respiratory siphon 21.4, width of head 2.35, width of an eye 1.16, interocular space 1.02; pronotum anterior width 2.75, humeral width 3.29, along median line length of anterior lobe 7.9, length of posterior lobe 3,2, total length 11.1; fore leg, length of coxa 6.5, femur length of distal part (measured in relation to the larger inner tooth) 3.4, length of proximal part 6.0; middle leg length of femur 17.6, length of tibia 18.4; hind leg length of femur 19.2, length of tibia 21.6.

Colour. Light brown, scutellum, membrane and apertures of static organs darker; fringe of siphon mixed with blackish hairs; dorsum of abdomen with a reddish tinge. Operculum and legs yellowish, tibiae indistinctly banded with light brown, middle and hind femur unicolorous, fore coxae, femurs and pronotum covered with a crust of silt.

Head. Lora indistinctly separated from the eyes; clypeus distinctly higher than lora, interoculus tuberculate (Fig. 1), distinctly narrower than width of an eye; in lateral view eyes reaching just below the venter of head. Right antenna as in fig. 6, left antenna with the finger like projection of segment 2 absent.

Thorax. Pronotum with a broad anterior collar, transverse sulci virtually restricted to the dorsal face of prothorax. Prosternum somewhat flattened with a poorly defined median carina in anterior fifth. Prothoracic pit (posteriorly on prosternum) well developed, anterior margin of mesosternum with a pair of wart-like swellings. Distance between middle coxae half the distance between hind coxae (0.2/0.4). Metasternum posteriorly emarginate.

Femur. Anterior femur (Figs 2, 3) with a tooth on inner side and a rounded swelling on outer side near distal third. Middle femur when stretched along body reaching caudal ⅘ of sternite V, hind femur reaching just over halfway sternite VI.

Siphon. Short (when folded back over dorsum reaching anterior fifth of hemielytra or the level of posterior margin of abdominal sternite 3) with a strongly developed ventral fringe of hairs, broadening caudally, the length of the hairs caudally at least twice the width of the siphon.

♂ genitalia. Genital capsule (Fig. 4), paramere comparatively stout and of a form reminding some Old World species (Figs 7, 8), posterior diverticulum turned sightly upward, not widened, sclerotized lever rods of vesica indistinct (Fig. 5, compare Lansbury 1974 for discussion and figures of inner structure of genital capsule of various American *Ranatra* species).

Etymology. Flokatos (phlokatos), greek adjective meaning "fringed" referring to the characteristic fringe ventrally on siphon.

Comparative notes. The form of the paramere and the strong fringe on the respiratory siphon set this species apart from all South American species. The paramere reminds somewhat of the East African *R. fuscoannulata* or the Asian *R. gracilis*-group (Lansbury 1972), species of the latter also have a tuberculate interoculus and short siphon. All are distinctly smaller, differ in various details of structural characteristics and lack the thick fringe of hairs ventrally on siphon. There are only two other South American species with a tuberculate interoculus. Of these *R. weberi* De Carlo known only by the holotype from Brazil, Amazonas is much smaller, body length 24 mm. *R. tuberculifrons* Montandon from the Guyanas and Brazil, Amazonas (Nieser 1975) is about the same size but has a more slender paramere especially in the upper part. In addition the fore femur is also distinctly more slender and the siphon lacks the thick fringe of hairs.

Remarks. The asymmetry of the antennae illustrates once more that these organs in Nepidae are prone to variation and should, especially in single specimens or populations, not be relied on too heavily in distinguishing species.

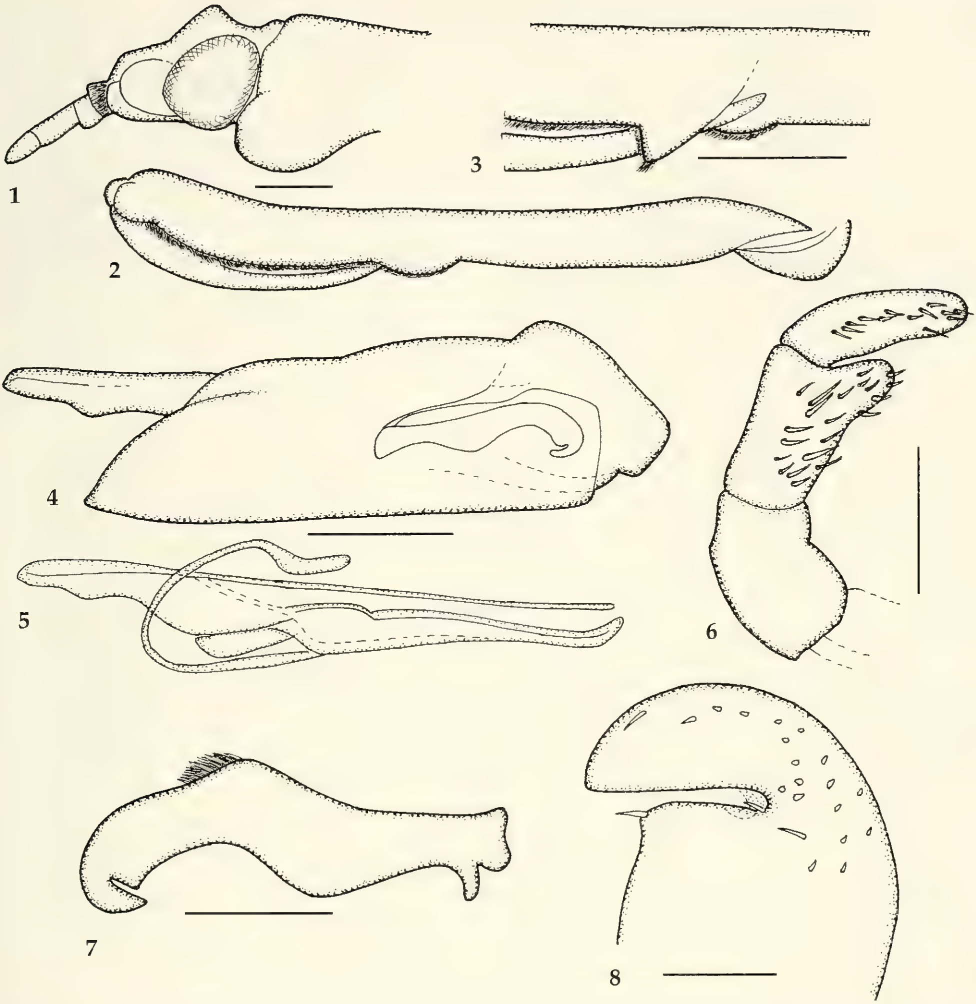
Ranatra machrisi, spec. nov.

Figs 9-11, 13-15, 17-19

Types. Holotype: ♂, Brasil, Goiás, 24 km E Formosa, May 29, 1956 (MNRJ). – Paratype (allotype): ♀, same data as holotype (Los Angeles County Museum, Los Angeles, Ca./U.S.A.)

Description

Measurements. Body length (without siphon) ♂ 37, ♀ 41; respiratory siphon ♂ 25.5, ♀ 27; width of head ♂ 3.32, ♀ 3.65; width of an eye ♂ 1.20, ♀ 1.32; interocular space ♂ 0.92, ♀ 1.02; pronotum anterior width ♂ 2.52, ♀ 2.70; humeral width ♂ 3.30, ♀ 3.68; along median line length of anterior lobe ♂ 6.6, ♀ 7.1; length of posterior lobe ♂ 3.0, ♀ 3.3; total length ♂ 9.6, ♀ 10.4; fore leg, length of coxa ♂ 7.8, ♀ 9.0; femur length of distal part (measured in relation to the inner tooth) ♂ 4.1, ♀ 4.3; length of proximal part ♂ 7.6, ♀ 8.3; middle leg length of femur ♂ 19.0, ♀ 20.3; length of tibia ♂ 20.7, ♀ 22.3; hind leg length of femur ♂ 20.2, ♀ 21.1; length of tibia ♂ 24.6, ♀ 25.9.



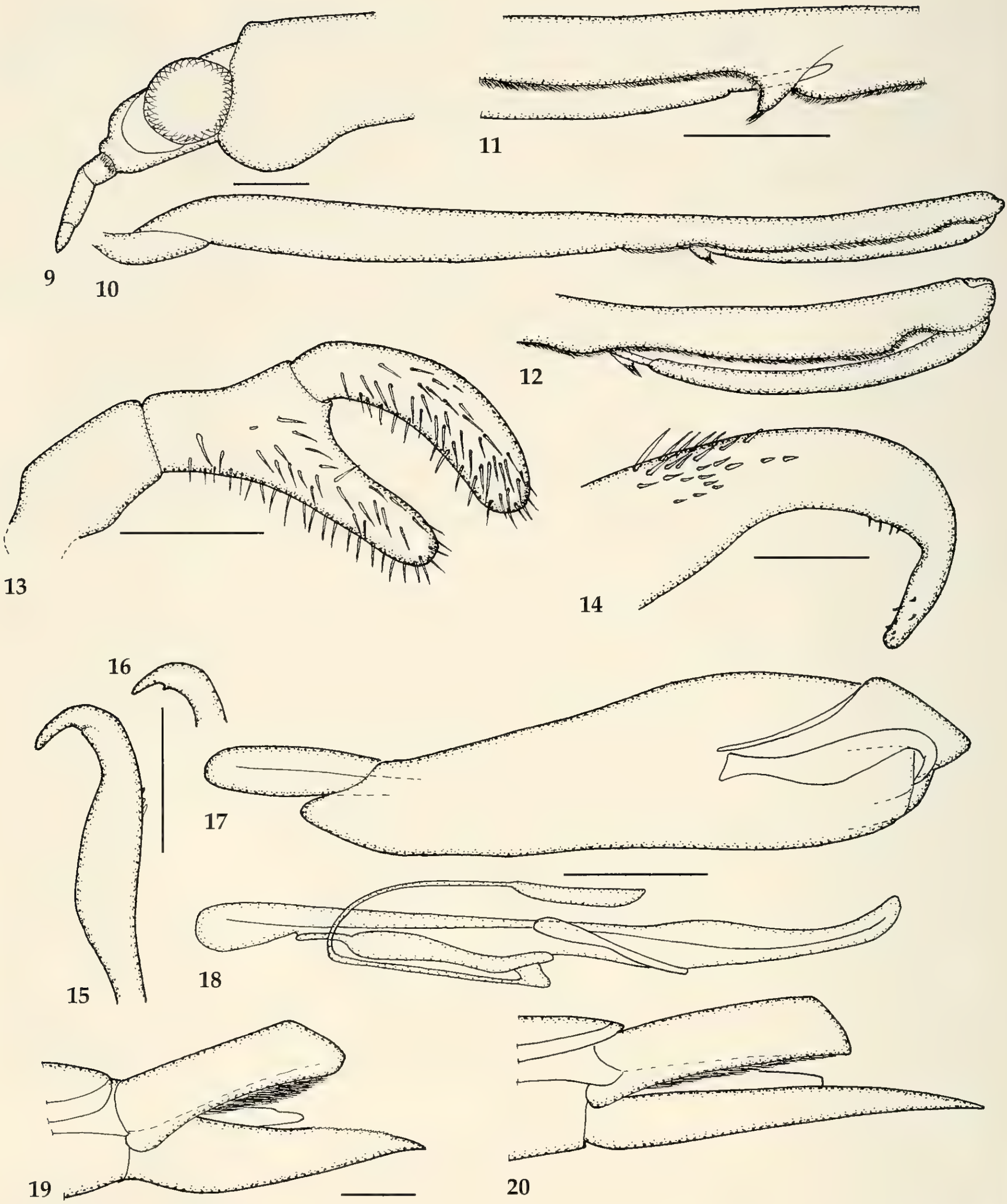
Figs 1-8. *Ranatra flokata*, spec. nov. Holotype ♂. **1.** Head and anterior part of prothorax in lateral view. **2.** Anterior femur and tibia lateral view. **3.** Anterior femur, tibia and tarsus, detail inner view. **4.** Genital capsule. **5.** Sclerites inside genital capsule. **6.** Antenna. **7.** Paramere. **8.** Apex of paramere. Scale bars = 1 mm.

Colour. Rather uniform dull medium brown, membranes darker. venter slightly lighter than dorsum (with closed hemielytra). Anterior femur and tibia, middle and hind femora yellowish with indistinct light brown mottling.

Head (Fig. 9). Lora distinctly separated from eyes, clypeus slightly higher than lora, eyes distinctly wider than interoculus. Antenna as in fig. 13.

Thorax. Pronotum with collar on anterior margin poorly developed, transverse sulci deep, reaching halfway down the sides of prothorax. Prosternum with a low broad keel flanked by a pair of shallow but broad grooves running from anterior margin backward to level of sulci or slightly beyond. Prothoracical pit poorly defined, no pair of wartlike tubercles on anterior margin of mesosternum. Distance between intermediate coxae twice the distance between posterior coxae (0.4/0.2). Metasternum a narrow carina with posteriorly diverging flanges laterally.

Femur. Anterior femur (Figs 10,11) with tooth at distal third and a slight shallow indentation apically. Middle femur in male just reaching base of operculum, in female caudal quarter of sternite 6;



Figs 9-11, 13-15, 17-19. *Ranatra machrisi*, spec. nov. **9.** Head in lateral view, allotype ♀. **10.** Anterior femur, tibia and tarsus, lateral view, holotype ♂. **11.** Detail of 2, inner view. **13.** Antenna allotype ♀. **14.** Apex of paramere, holotype. **15.** Paramere, holotype. **17.** Genital capsule, holotype. **18.** Sclerites inside genital capsule, holotype. **19.** Genital operculum lateral view, allotype ♀.
Figs 12, 16, 20. *Ranatra montei* De Carlo. **12.** Apex of femur, tibia and tarsus. **16.** Apex of paramere. **20.** Female genital operculum, lateral view. Scale bars: Figs 9-12, 16-20: 1 mm; 7, 15: 0.5 mm; 6, 13: 0.25mm; 8, 14: 0.1 mm.

hind femur in male just not reaching apex of operculum, in female reaching halfway operculum. Siphon. When folded back reaching humeri of pronotum in both sexes.

♂ genitalia. Genital capsule (Fig. 17), paramere with the subapical tooth reduced, nearly absent

(Fig. 15), posterior diverticulum turned sightly upward, not widened, sclerotized lever rods of vesica indistinct (Fig. 18, compare Lansbury 1974 for discussion and figures of inner structure of genital capsule of various American *Ranatra* species).

♀ genitalia. Genital operculum reaching distinctly beyond apex of abdomen, dorsal margin serrate (Fig. 19).

Etymology. Machrisi, genitive of Machris, named after the family who sponsored the expedition during which the specimens were collected (Truxal 1957).

Comparative notes. Very similar to *Ranatra montei* De Carlo which is common in Minas Gerais and Goiás in similar streams as *R. machrisi* was apparently found (Truxal 1957). Differences are the notch apically in fore femur which is more distinct in *R. montei* (Figs 10, 12); the subapical tooth of paramere which is more distinct in *R. montei* (Figs 15, 16) and the female genital operculum which in *R. montei* is distinctly longer but not serrate dorsally (Figs 19, 20).

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8. Epple, W.: Rabenvögel. Göttervögel – Galgenvögel. – Verlag G. Braun, Karlsruhe (1997). 120 Seiten, 60 Farbfotos, gebunden. ISBN 3-7650-8135-3.

Manchen Vögeln haftet seit der Antike ein böses Omen an: "Rabenvater, diebische Elster, eine Krähe hackt der anderen kein Auge aus (Schafen aber schon)", Vorurteile, gegen deren allfällige Verankerung im Unterbewußtsein selbst Ornithologen vergebens Aufklärungsarbeit leisten. Was an diesen Zuweisungen daran ist, weiß W. Epple im vorgelegten Buch unterhaltsam und gleichzeitig biologisch exakt zu schildern.

Didaktisch geschickt die Gliederung: Der nötige Informationsteil über die einzelnen Arten wird nach hinten verbannt. Vorne die emotionsgeladenen Kapitel: Vorurteile gegen Fakten, Schießen gegen Schützen, Entwicklung der Hetzkampagnen im Lichte wachsenden Naturschutzdenkens. Positives in der Familie Rabenvögel wird dagegengestellt: innerartliche Bestandsregulation, Tannen- und Eichelhäher als Verbreiter von Baumarten, Partnertreue usw. Typische Verhaltensweisen sind in scharfen Farbaufnahmen festgehalten und kommentiert.

Die Aufmachung im Querformat 24.5 × 23 cm und der Text, der viel sicheren Argumentationsstoff bietet, sprechen Laien wie Fachmann gleichermaßen an. Nach dem Band "Eisvögel" zeigt der Braun-Buchverlag erneut, daß er mit dieser Serie auf dem richtigen Weg ist. T. Mischler

9. Garthe, S.: Die Vogelwelt von Hamburg und Umgebung. Band 1 & 2 (1984 von C. Holzapfel, O. Hüppop & R. Mulsow), Bd. 3 (1996). – Wachholtz Verlag, Neumünster. 480 S., 179 Abb., 28 Farbfotos, geb. ISBN 3-529-073156.

Das Erscheinen der ersten beiden Bände liegt 13 Jahre zurück. Bd. 1 beschreibt das Untersuchungsgebiet und seine naturräumliche Gliederung, Vogelzug und historische Entwicklung der Avifaunistik in Hamburg. Im 2. Bd. beginnt die systematische Abhandlung der Arten (Prachttaucher bis Großtrappe) nach folgendem Schema: Artnummer und -name, Häufigkeit und Status, Verbreitung, Biotop, Bestand, Nahrung, Schlafplätze, Bedrohung, Schutz und gesetzliche Grundlagen. Verbreitungskarte und Graphik der Individuensummen im Jahresgang runden bei den regulären Arten ab.

Mit größerer Pause erschien nun Band 3 der Lokalavifauna Hamburgs. Wechsel des Hauptbearbeiters und wachsende Datenflut, die auch zum Anschwellen bei der einzelnen Art führte, waren die Gründe. Man wird sich fragen, wieso für die etwa 100 Arten – von den Laro-Limikolen bis zu den Spechten der letzte Nichtsingvogelband – samt Ausnahmeerscheinungen wie z.B. Steppenflughuhn fast 500 Seiten für den doch recht kleinen hamburger Raum benötigt werden. Auch lassen sich Phänologievergleiche zu den Arten der Vorbände kaum ziehen, da für den jetzigen meist das um eine Dekade jüngere Beobachtungsmaterial herangezogen wurde. Trotz allem ist die gründliche Darstellung zu loben. Für Einzelbeobachtungen und Tabellen ist viel Raum verbraucht worden. Hinter S. 112 findet sich plötzlich ein Farbteil mit Habitat- und Brutaufnahmen von dokumentarischem Wert, ohne daß man im Text bei der betreffenden Art darauf verwiesen wird. Daß man auch einen solch ordinären Vogel wie die Straßentaube gewinnbringend ins Visier nehmen kann, beweisen die Hamburger mit genauer Verfolgung des Jahresganges, der Farbtypen und der innerstädtischen Ausbreitung.

Ein sehr ausführlicher 3. Band, bei dem für Hamburger – mit 37 S. Literaturangaben – kaum Fragen offenbleiben. Hoffentlich kann man die Singvögel bald anfügen! T. Mischler

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On *Ecitocobius*, a new genus from Central Amazonia with comments on the tribe Attacobiini

(Arachnida, Araneae, Corinnidae, Corinninae)

Alexandre B. Bonaldo and **Antonio D. Brescovit**

Bonaldo, A. B. & A. D. Brescovit (1998): On *Ecitocobius*, a new genus from Central Amazonia with comments on the tribe Attacobiini (Arachnida, Araneae, Corinnidae, Corinninae). – Spixiana **21/2:** 165-172

Ecitocobius, gen. nov. is proposed for *E. comissator*, spec. nov., from Central Amazonia, Brazil. A new record and additional illustrations of *Attacobius attarum* (Roewer) are given. *A. verhaaghi* , spec. nov. from Ceará State, Brazil is described. The tribe Attacobiini and the genus *Attacobius* are rediagnosed on the base of putative derived characters.

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Introduction

Recently, knowledge of the family Corinnidae was increased by Platnick & Baptista (1995) who transferred the tribe Attacobiini from Liocranidae to Corinninae. This tribe, comprising only the type genus *Attacobius* Mello-Leitão, was characterized by the large anterior median eyes, recurved anterior eye row, absence of serrula, reduced leg spination and darkened and laterally compressed tips of the tarsi.

In this paper we propose a second genus of Attacobiini, *Ecitocobius* which includes the first known two-eyed representative of the family Corinnidae, an odd spider found running in a column of the army ant *Eciton burchelli* (Westwood). The discovery of this new genus which seems to be the sister group of *Attacobius*, permits testing the synapomorphies of the tribe. The reduced leg spination and the absence of a serrula seem to be derived characters for Attacobiini. As *Ecitocobius* has only the anterior median eyes, the eye row shape remains untestable. However, two other characters can be considered as putative synapomorphies for the tribe: labium much wider than long (first observed by Mello- Leitão 1923) and the male palp with a long, thin retrolateral process, medially embedded in the tegulum, here called attacobiine tegular process.

The laterally compressed tips of the tarsi seem to be exclusive to *Attacobius* species and this character is herein considered an apomorphy of that genus. The bipartite anterior median eye pattern described by Platnick & Baptista (1995) for *Attacobius* is absent in *Ecitocobius*. Since this pattern is easily observed in fresh material (specimens of *A. attarum* recently collected) as well as in poorly preserved specimens (as in the types of *A. luederwaldti* (Mello-Leitão)), the absence of this feature in *Ecitocobius* is unequivocal. Thus, assuming the similar structure present in the liocranid genus *Andromma* Simon as homoplastious, the demarcation in each anterior median eye can be considered as another apomorphy of *Attacobius*.

In addition to a rounded retrolateral cymbial tubercle which is usual among corinnines, the palp of the unique male of *Attacobius* hitherto known (*A. attarum*) has a large, excavated, retrolaterally directed cymbial projection (Figs 12, 13; Platnick & Baptista 1995, figs 16, 17). This character could be an autapomorphy of *A. attarum* or another apomorphy of *Attacobius*, as *Ecitocobius* has only the retrolateral cymbial tubercle. Also described here is a new species of *Attacobius*, which extends the range of the genus to Ceará state, north-east Brazil. This species has laterally compressed but not darkened leg tarsi and median eyes of similar size.

Until other species of *Ecitocobius* can be found, two synapomorphies are hypothesized for this genus: the loss of the anterior lateral and posterior eyes, and leg metatarsi with a ventral, apical unpaired curved spine.

The specimens examined belong to the following institutions: MCN, Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre (E. H. Buckup); IBSP, Instituto Butantan, São Paulo (A. D. Brescovit); SMF, Forschungsinstitut Senckenberg, Frankfurt (M. Grasshoff); SMNK, Staatliches Museum für Naturkunde, Karlsruhe (H. Höfer). All measurements are in millimeters. The format of the descriptions and abbreviations follow those used in Bonaldo & Brescovit (1994).

Ecitocobius, gen. nov.

Type species. *Ecitocobius comissator*, spec. nov.

Diagnosis. *Ecitocobius* can be distinguished from *Attacobius* by at least four characters, two of which are presumably synapomorphies: the absence of anterior lateral and posterior eyes (Fig. 7) and the presence of a ventral, apical unpaired curved spine on all leg metatarsi (Fig. 1). Additional key characters are the absence of any distinctive pattern in the anterior median eyes and the unmodified leg tarsi.

Description

Carapace piriform in dorsal view, widest at coxae II (Fig. 7); arched in lateral view, highest at palpal insertion, declining anteriorly and posteriorly (Fig. 8). Cephalic area not delimited by notable narrowing, anterior margin truncate. Thoracic groove long. Clypeal height slightly greater than anterior median eye diameter. Anterior median eyes on common tubercle, frontal, circular, small, without bipartite pattern; anterior lateral, posterior median and lateral eyes absent. Chilum entire, not setose. Chelicerae slightly shorter than half of carapace length, without lateral boss, with retrolateral, proximal field of setae; one large prolateral tooth with one denticle on each side situated near tip of fang furrow; two small, subequal, retrolateral teeth at middle of fang furrow. Endites convergent, without serrula, promargin rounded, retromargin not excavated. Labium wider than long, slightly constricted proximally, smaller than half of endite length. Sternum convex, slightly wider than long, rebordered. Precoxal triangles present (Fig. 9).

Leg formula 4 1 2 3. Legs long, thin, covered by modified stiff feathery setae and simple hairs (Figs 1, 2, 4); tarsi and metatarsi with thin scopula; distal cluster of ventral setae on metatarsi III and IV hardly notable; all metatarsi with unpaired, curved, ventral, distal, pilose spine (Fig. 1). Leg tarsi with two pectinate claws, distinct onychium and dense claw tufts (Fig. 3), slightly expanded medially, tip not compressed laterally. Trichobothria present on tibiae, metatarsi and tarsi; trichobothrial bases bearing few transversal ridges and one curved ridge, traversing lowered plate (Fig. 5). Tarsal organ capsulate, with large circular aperture (Fig. 6). Trochanters not notched.

Abdomen suboval, constricted anteriorly (Fig. 7), covered by few long setae; dorsal scutum and tracheal tubercle absent. Colulus triangular, small, haired. Six spinnerets; anterior lateral spinnerets slightly convergent and conical, contiguous at base, two-segmented, distal segment short, truncate; posterior median spinnerets small, parallel, tubular, contiguous, one-segmented; posterior lateral spinnerets parallel, separated by less than their diameter, two-segmented, distal segment short, truncate. Anal tubercle inconspicuous.

Male palp with large bipartite retrolateral tibial apophysis; tegulum with typical corinnine coiled duct and hyaline conductor. Attacobiini tegular process present (Figs 10, 11).

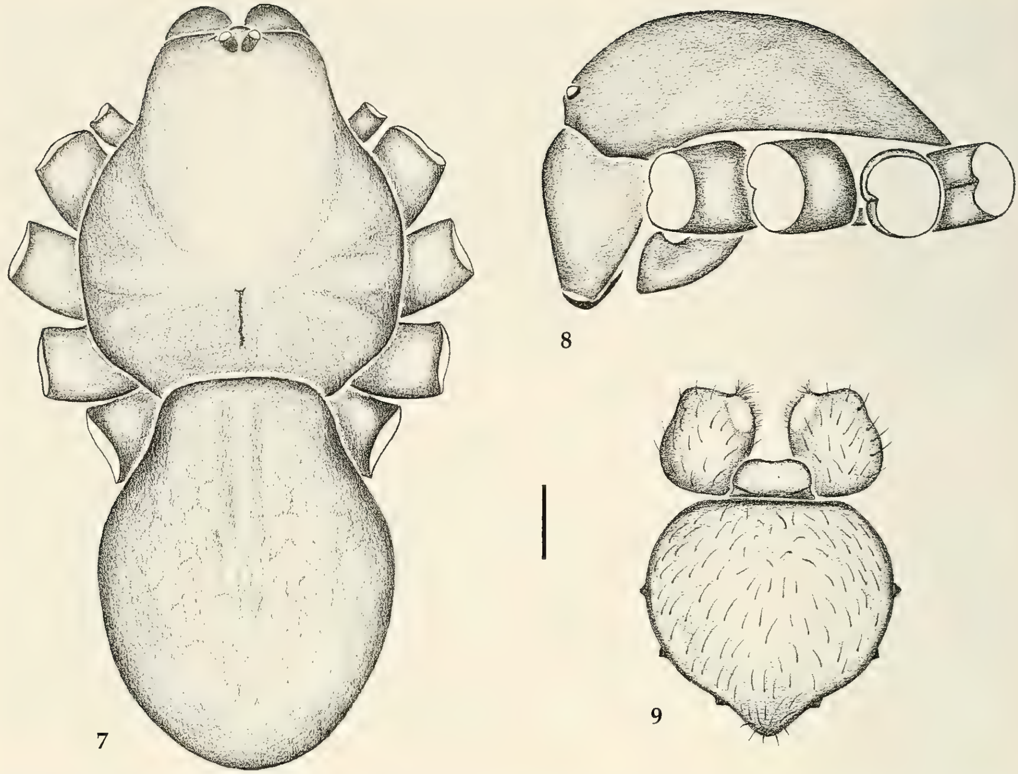
Etymology. *Ecitocobius* is a contraction of *Eciton* and *Attacobius* and is masculine in gender.

Figs 1-6. *Ecitocobius comissator*, spec. nov. ♂, leg I. **1, 2.** Metatarsus, lateral view. **3.** Apex of tarsus, lateral view. **4.** Tarsus, subventral view. **5.** Tarsal trichobothrium, dorsal view. **6.** Tarsal organ, dorsal view.

Ecitocobius comissator, spec. nov.
Figs 1-11

Types. Holotype: ♂, Reserva Florestal Adolpho Ducke, Manaus, Amazonas, Brazil, May 31, 1993, H. Höfer col. (MCN 26589).

Diagnosis. With the characters of the genus and male palp as in figs 10, 11.



Figs 7-9. *Ecitocobius comissator*, spec. nov. ♂. **7.** Body, dorsal view. **8.** Cephalothorax, lateral view. **9.** Sternum, labium and endites, ventral view. Scale lines: 0.25 mm.

Description

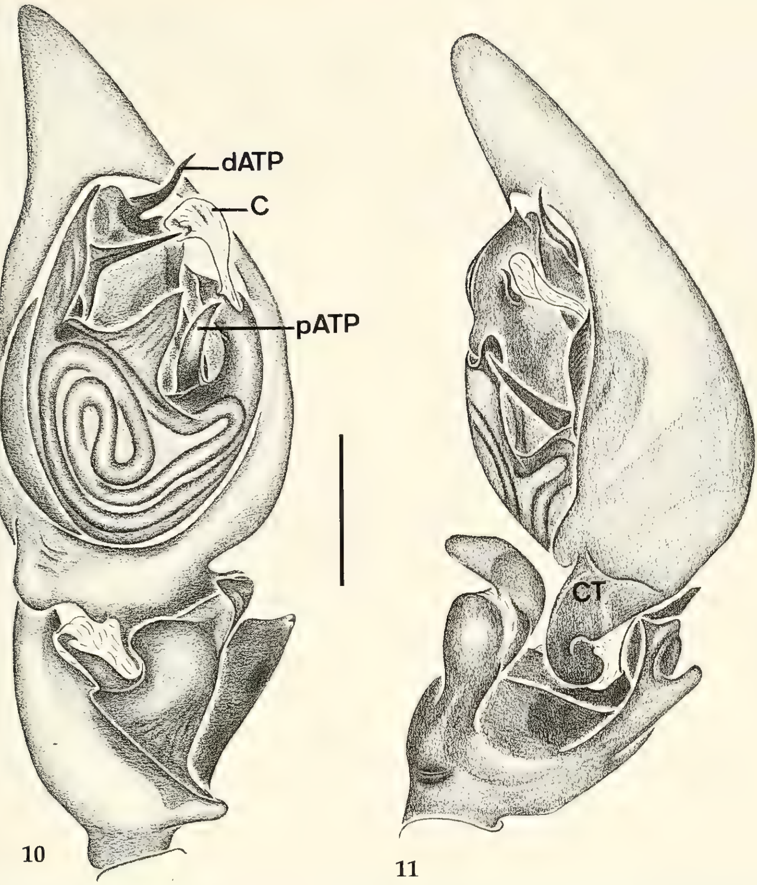
♂ (holotype). Carapace yellow, cephalic area orange; chelicerae orange; endites yellow with white apices; labium yellow; sternum yellow with orange borders; legs yellow, gradually shading to orange distally; abdomen white, spinnerets yellow.

Total length: 2.80. Carapace: 1.80 long, 1.20 wide, 0.57 high. Clypeus: 0.07 high. AME diameter: 0.07; AME-AME interdistance: 0.06; front width: 0.15. Chelicerae: 0.57 long, with 3 promarginal teeth and 2 retromarginal denticles. Sternum: 0.82 long, 0.87 wide. Abdomen: 1.50 long, 1.05 wide.

Leg measurements: I: femur 1.30, patella 0.50, tibia 1.10, metatarsus 1.15, tarsus 0.85, total 4.90. II: 1.25, 0.50, 1.00, 1.10, 0.80, 4.65. III: 1.20, 0.45, 0.90, 1.20, 0.80, 4.55. IV: 1.30, 0.45, 1.15, 1.50, 1.00, 5.40. Leg spination: I: femur d1-0-0, p0, r0, v0; tibia d0, p0, r0, v1p-2-2; metatarsus d0, p0, r0, v2-2-1. II: femur d1-0-0, p0, r0, v0; tibia d0, p0, r0, v0-2-0; metatarsus d0, p0, r0, v2-2-1. III: femur d1-0-0, p0, r0, v0; tibia d0, p0-0-1, r0-0-1, v0; metatarsus d0, p0, r0, v0-2-1. IV: femur d1-0-0, p0, r0, v0; tibia d0, p0, r0-0-1; v0-1p-0; metatarsus d0, p0, r0, v2-2-1.

Palpus. Femur and patella unmodified, tibia with basal, retrolateral projection and large bipartite retrolateral apophysis; ventral extension large, bifid at base, with small prolateral prong with tip curved retrolaterally and large retrolateral prong with tip curved prolaterally; dorsal extension bifid distally. Cymbium with basal, relatively short retrolateral tubercle. Tegulum with ventral, basal coiled duct and large median triangular, laminar extension projecting retrolaterally over deep excavation. Attacobiine tegular process long, medially embedded in tegulum, with proximal end (pATP, fig. 10) parallel to tegular laminar projection and distal end (dATP, fig. 10) directed retrolaterally. Unmodified hyaline conductor (C, fig. 10) with subapical, retrolateral insertion. Embolus pointed, straight, subapical spur with prolateral insertion, directed retrolaterally (Figs 10, 11).

♀. Unknown.



Figs 10, 11. *Ecitocobius comissator*, spec. nov. ♂. 10. Palp, ventral view. 11. Palp, retrolateral view. Scale lines: 0.25 mm. Abbreviations: C: conductor; CT: cymbial tubercle; dATP: distal end of attacobiine tegular process; pATP: proximal end of attacobiine tegular process.

Distribution. Known only from type locality.

Material examined. Only the holotype.

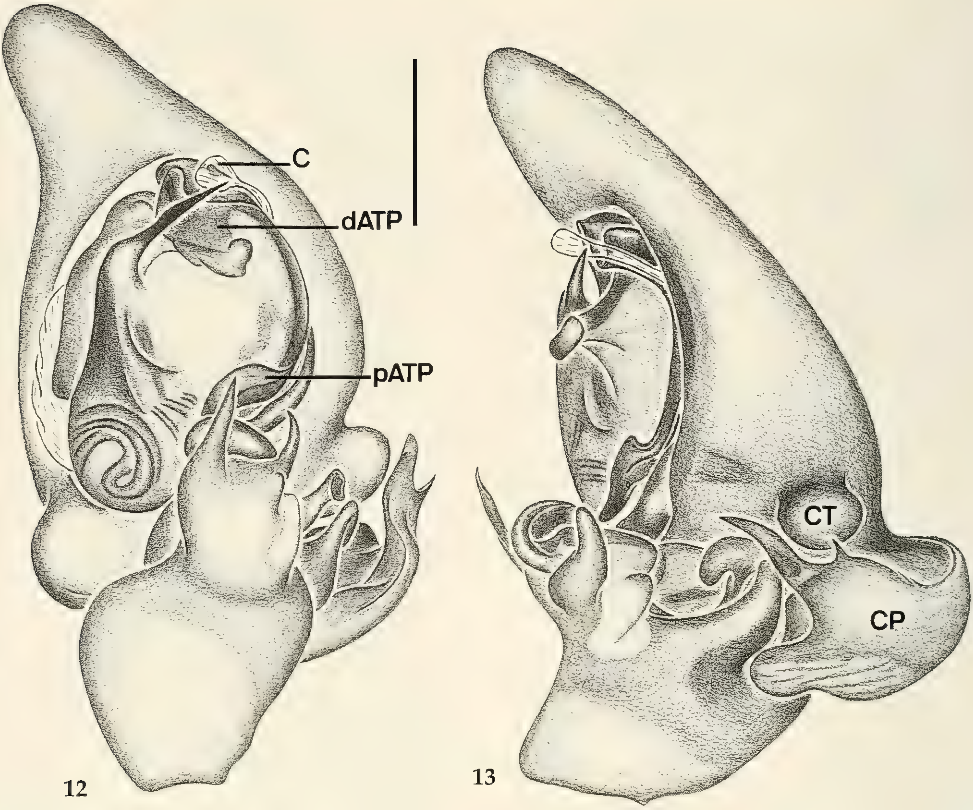
Etymology. A latin substantive, *comissator* means the companion, in allusion to the association of this spider with ants.

Natural History. The holotype was collected during the day running in a column of the nomad army ant *Eciton burchelli* which are aggressive spider predators (see Viera & Höfer 1994 for information on the ecology of this ant and its spider prey in Central Amazonia). *Ecitocobius comissator* is apparently tolerated by the ants but the amazing riding behavior described for some *Attacobius* species was not observed (Dr. H. Höfer, pers. comm.).

Attacobius attarum (Roewer)

Figs 12, 13

Myrmeques attarum Roewer, 1935: 194, figs 1a-d, 2a-d (one ♂ and three ♀♀ syntypes, Mendes, Rio de Janeiro, Brazil, SMF, Roewer Collection n° 4924, examined).
Attacobius attarum, Platnick 1993: 602; Platnick & Baptista 1995: 8.



Figs 12, 13. *Attacobius attarum* (Roewer). ♂. **12.** Palp, ventral view. **13.** Palp, retrolateral view. Scale lines: 0.25 mm. Abbreviations: C: conductor; CP: cymbial process; CT: cymbial tubercle; dATP: distal end of attacobiine tegular process; pATP: proximal end of attacobiine tegular process.

Note. This species was redescribed by Platnick & Baptista (1995). Unfortunately, the conductor did not appears in their illustrations of the ♂ palp, although being as referred to in the text as "translucent flange of bifid conductor". We provide supplementary illustrations (Figs 12, 13). The palp of *A. attarum* has an unmodified hyaline conductor (C, fig. 12), with its insertion covered by the tegular edge and the large attacobiine tegular process, medially embedded at the edge of the tegulum, with complex distal end (dATP, fig. 12) and free, enlarged proximal end (pATP, fig. 12). The distal end has folded apices (called "median arm of bifid conductor" by those authors) and a broad, flat extension (called "median apophysis"), ending in a protruded hook-like piece. The median part and the proximal end of the tegular process were called the "lateral arm of bifid conductor".

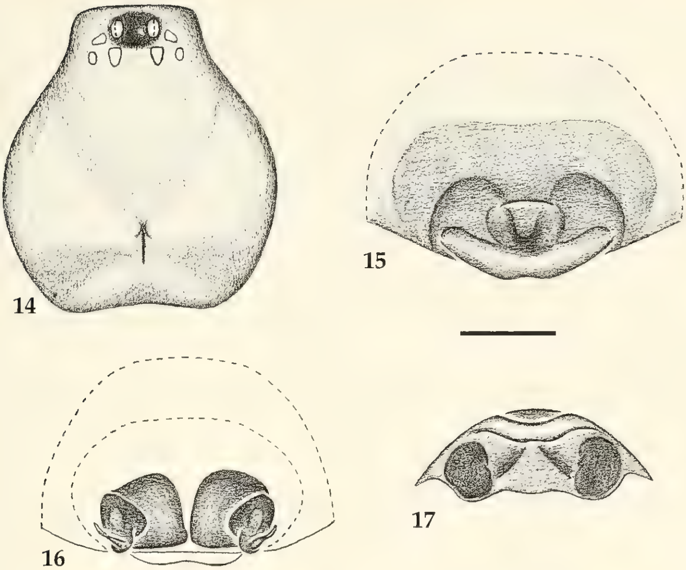
New Record. BRAZIL, Rio de Janeiro: Campos, 2♀♀, 2 immat., V.1995, A. Tonhasca Jr. Col. (IBSP 6924, MCN 27664). Clinging to the head of the ant *Atta sexdens rubropilosa* (Forel).

Attacobius verhaaghi, spec. nov.

Figs 14-17

Types. Holotype: ♀, Chapada do Araripe (10 km from Crato) 39°30'W, 07°10'S (850m el.), Ceará state, Brazil, 30.I.1995, M. Verhaagh & D. Frey col. (MCN 26589). – Paratype: 1♀, with the same data as holotype (SMNK).

Diagnosis. *A. verhaaghi* can be easily distinguished by the dark oval spot on anterior median eye area and by the epigynum with large, quadrangular spermathecae (Figs 14, 16).



Figs 14-17. *Attacobius verhaaghi*, spec. nov. ♀. **14.** Carapace, dorsal view. **15.** Epigynum, ventral view. **16.** Epigynum, dorsal view. **17.** Epigynum, posterior view. Scale lines: 0.25 mm.

Description.
♀ (holotype). Carapace yellow, with black spot on anterior median eye area; mouth parts yellow; sternum yellow with brown borders; legs and abdomen yellow.

Total length: 3.85. Carapace: 1.65 long, 1.50 wide, 0.47 high. Clypeus: 0.13 high. Eye diameter and interdistances: AME 0.10, ALE 0.10, PME 0.08, PLE 0.06; AME-AME 0.08, AME-ALE 0.03, PME-PME 0.15, PME-PLE 0.07, ALE-PLE 0.02; MOQ length: 0.25, front width: 0.27, back width: 0.31. Chelicerae: 0.69 long, with 2 promarginal teeth and 2 retromarginal denticles. Sternum: 1.01 long, 1.06 wide. Abdomen: 2.25 long, 1.45 wide.

Leg measurements: I: femur 1.50, patella 0.60, tibia 1.30, metatarsus 1.35, tarsus 1.05, total 5.80. II: 1.45. 0.50, 1.20, 1.30, 1.05, 5.50. III: 1.35, 0.50, 1.10, 1.25, 1.05, 5.25. IV: 1.60, 0.50, 1.40, 1.55, 1.10, 6.15. Leg spination: I: femur d1-1-0, p0, r0, v0; tibia d0, p0, r0, v2-2-2; metatarsus d0, p0, r0, v2-1r-0. II: femur d1-1-0, p0, r0, v0; tibia d0, p0, r0, v2-2-2; metatarsus d0, p0, r0, v2-2-0. III: femur d1-1-0, p0, r0, v0; tibia d0, p0, r0 v0; metatarsus d0, p0, r0, v0. IV: femur d1-1-0, p0, r0, v0; tibia d0, p0, r0, v0; metatarsus do, p0, r0, v0.

Epigynum. Composed of large sclerotized plate with depressed median U-shaped area. Internally with large, quadrangular spermathecae (Figs 15-17).

♂. Unknown.

Variation. Paratype: total length 4.10; carapace 1.67; femora I 1.52.

Distribution. Known only from type locality.

Material examined. Only the types.

Etymology. The specific name is a patronym in honor of one of the collectors of the types.

Natural history. The specimens were collected in the wet semiperennial forest at Araripe National Forest. No special relation with ants was observed by the collectors.

Acknowledgments

We thank Charles E. Griswold of the Californian Academy of Sciences (San Francisco), Erica H. Buckup of the MCN, Hubert Höfer of the SMNK, Norman I. Platnick of the American Museum of Natural History (New York) and Roberto Reis of the Pontifícia Universidade Católica (Porto Alegre) for helpful comments on drafts of the manuscript. Athaide Tonhasca Jr. of the Universidade Federal Rural do Rio de Janeiro (Campos) kindly donated the specimens of *Attacobius attarum*. The types of *A. attarum* and *A. luederwaldti* were kindly loaned by M. Grasshoff of SMF and Ricardo Pinto-da-Rocha of the Museu de Zoologia (Sao Paulo), respectively.

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Redescription of *Apocyclops dengizicus* (Lepeschkin, 1900) from Central Asia

(Crustacea, Copepoda)

Iskandar M. Mirabdullayev and **Tatiana S. Stuge**

Mirabdullayev, I. M. & T. S. Stuge (1998): Redescription of *Apocyclops dengizicus* (Lepeschkin, 1900) from Central Asia (Crustacea, Copepoda). – Spixiana **21/2:** 173-178

Apocyclops dengizicus (Lepeschkin) is redescribed based on material from Kazakstan and Uzbekistan. Data on variability and distribution are given.

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Introduction

Apocyclops dengizicus has been described by Lepeschkin (1900) as *Cyclops diaphanus* var. *dengizica* from the brackish-water lake Selety-Tengiz (northern Kazakstan). Kiefer (1926) attributed this cyclopoid to as an independent species, and Lindberg (1942, 1954) attributed it to as an independent subgenus, in the genus *Apocyclops*. Later, this species was reported worldwide in waterbodies of temperate and tropical regions of Asia, Africa, South and North America (Dussart & Defaye 1985), Europe (Monchenko 1974). However, the original description given by Lepeschkin is significantly outdated from the point of view of modern systematics of Cyclopidae; the type material was also lost. This severly hampers the work on the systematics of the genus *Apocyclops* Lindberg, 1942.

In this paper, we redescribe *Apocyclops dengizicus* on material from Kazakstan and Uzbekistan, and report data on variability and distribution of this species in Central Asia.

Material examined

Samples from more than 200 various waterbodies of Uzbekistan and more than 50 lakes and reservoirs of Kazakstan were examined (Fig. 1). *Apocyclops dengizicus* has been recorded in the following localities:

- Lake Tengiz (Akmola Region, central Kazakstan) August 1991 (11 females and 6 males); July 1995 (1 female and 1 male); salinity 26.0 g/l;
- a pool near the city of Karshy (southern Uzbekistan) September 1991 (10 females);
- pools in vicinities of the city of Termez (southern Uzbekistan) May 1992 (many females and males);
- pools and a ricefield in vicinities of the city of Khiva (western Uzbekistan) June 1992 (many females and males);
- Lake Saykul near the city of Nukus (northern Uzbekistan) September 1995 (many females) (coll. G. Turemuratova);
- Lake Esen near south bank of the Aral Sea (northern Uzbekistan) August 1961 (10 females) (coll. S. Embergenov).

Fig. 1. Localities sampled (.), localities of *Apocyclops dengizicus* (Lepeschkin) according to Lepeschkin (1900) (type locality) (∗), Dobrokhotova (pers. comm.) (■), Chuykov (1993) (▲) and this study (•).

All specimens are preserved in 4 % formaldehyde at the Institute of Zoology (Tashkent). A few specimens from Karshy are deposited in the National Museum of Natural History (Washington). All drawings were made using a camera lucida.

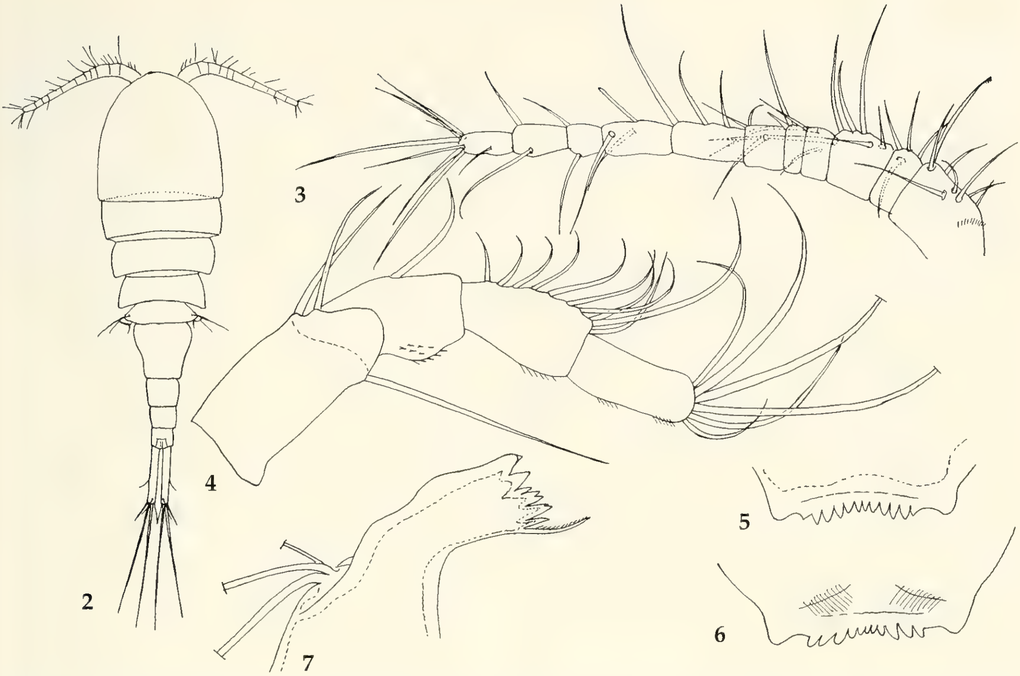
Apocyclops dengizicus (Lepeschkin, 1900)

Redescription

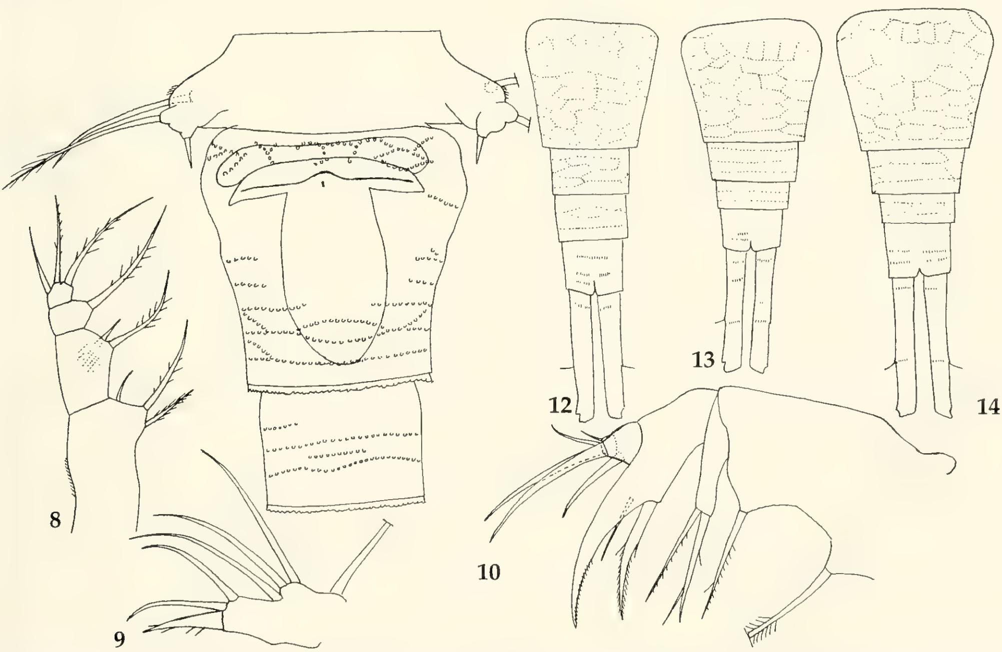
Female. Total body length 950-1.350 μm. Body widest at cephalothorax (Fig. 2). Antennule of 11 segments (19 specimens from 5 populations studied) (Fig. 3). Third segment of antenna with 10 setae (17 specimens studied) (Fig. 4). Labrum with 10-11 denticles (Figs 5, 6). Mandible, maxille, maxilleped and maxillular palp as in Figs 7-10. Lateral sides of last thoracic segment provided with short setules (Fig. 11). Genital segment expanded anteriorly (Fig. 11).

First three abdominal segments bearing rows (often interconnecting) of tiny pits (Figs 11-14). Last abdominal segment and furcal rami bear short rows of tiny spinules (Figs 12-15). Posterior margin of last abdominal segment with groups of tiny denticles on its ventral side. Furcal rami long and parallel, with lateral seta situated at the beginning of last third of rami (Figs 15-16). Implantation of external apical furcal setae provided with spinules.

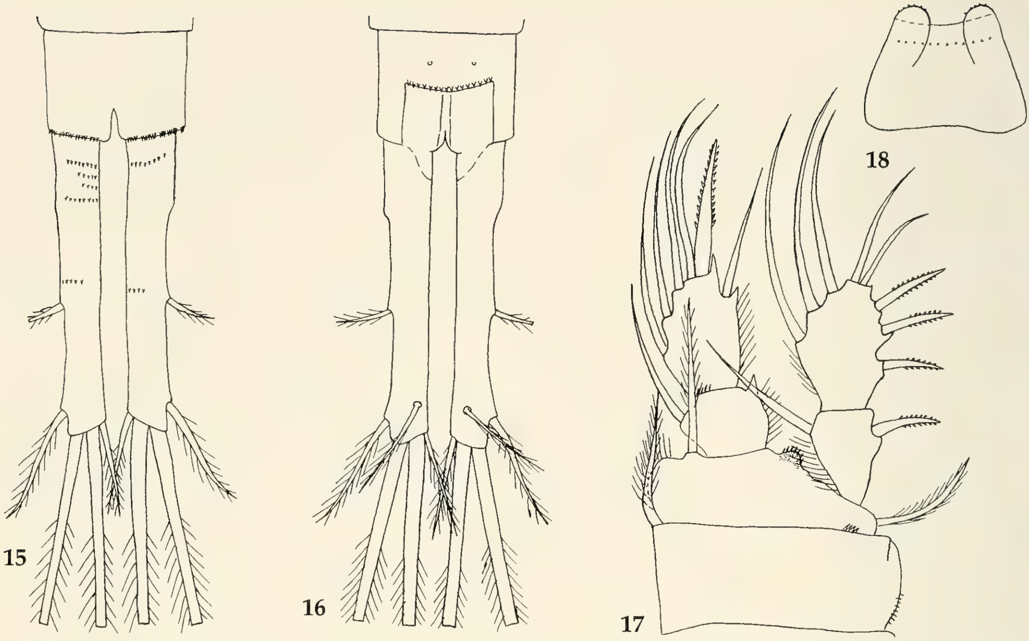
P1-P4 with biarticulated rami, spine formula 3.4.4.3, setal formula 5.5.5.5 (Figs 17, 19-21). Inner margin of basipodite P1 with long spine and setules (Fig. 17). Inner margins of basipodites of P1-P3 with setules (Figs 17, 19, 20), those of P4 devoid of setules. Precoxal plates of P1-P4 with rounded prominences, more developed at P1, and less at P4. The prominences bear tiny denticles (Figs 18, 22-24). Precoxal plates of P1-P3 bearing usually one row of tiny denticles on the caudal surface (Figs 18, 22, 24). However, specimens from a pool near Karshy and from Lake Saykul have 2 rows on the plates



Figs 2-7. *Apocyclops dengizicus* (Lepeschkin), ♀. **2.** General view. **3.** Antennule. **4.** Antenna. **5-6.** Labrum. **7.** Mandible.



Figs 8-14. *Apocyclops dengizicus* (Lepeschkin), ♀. **8.** Maxilliped. **9.** Maxillular palp. **10.** Maxilla. **11.** Last thoracic and first two abdominal segments. **12.** Abdominal segments, another specimen from Lake Tengiz. **13.** The same of specimen from Lake Saykul. **14.** The same of specimen from vicinities of Khiva.



Figs 15-18. *Apocyclops dengizicus* (Lepeshkin), ♀. **15.** Furca ventrally. **16.** Furca dorsally. **17.** P1. **18.** Precoxal plate of P1.

of P2 (Fig. 23). Precoxal plate of P4 with 4 rows of spinules (Fig. 25). Broad free article of P5 with relatively short inner spine and long external seta (Fig. 11).

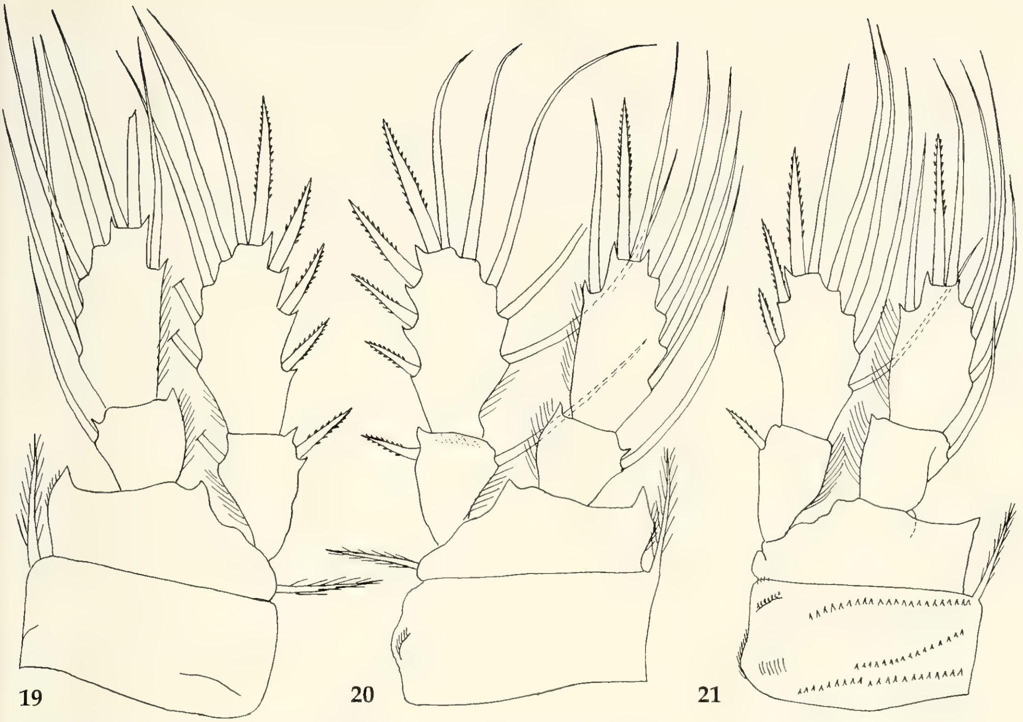
Elongated egg-sacs with 4-29 eggs.

Biometrical data are given in Tab. 1.

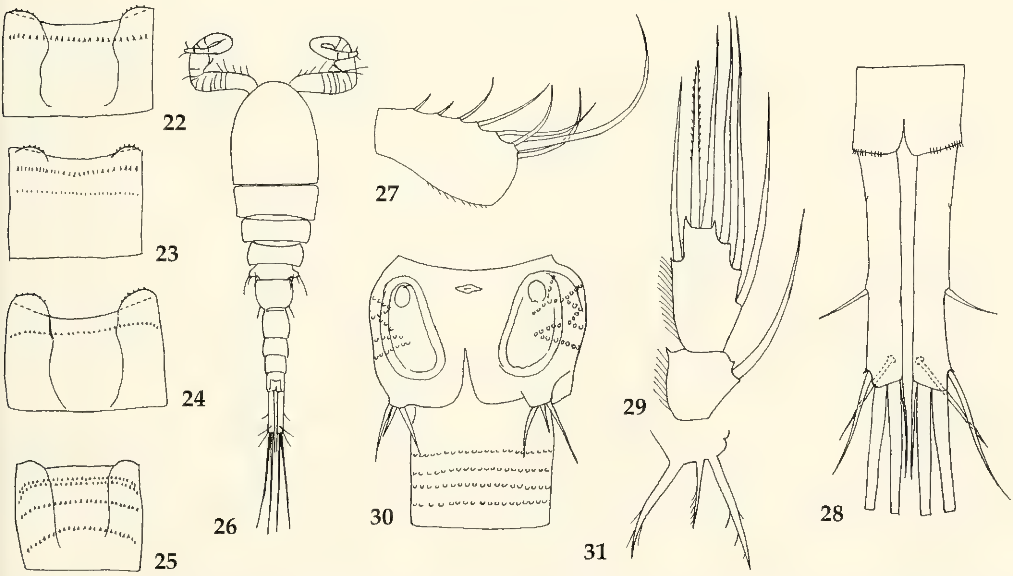
Male. Total body length 780-1.075 μm. Third segment of antenna with 8-9 setae (8 specimens studied had 8 setae, and 7 speciemens had 9 setae) (Fig. 27). Furcal rami 5.5-6.5 times as long as wide (Figs 26-28). 2EnpP4 1.70-2.00 times as long as wide. Apical spine of 2EnpP4 is relatively longer than those of female, 1.21-1.40 times as long as 2EnpP4 (Fig. 29). Setal and spine formula of P1-P4, ornamen-

Tab. 1. Data on measurements of females of *Apocyclops dengizicus* (Lepeschkin) from Kazakstan and Uzbekistan.

	Lake Tengiz n = 10		Lake Esen n = 10		Lake Sykul n = 10		Khiva n = 10		Karshi n = 10		Termez n = 10	
	min-max	x̄	min-max	x̄	min-max	x̄	min-max	x̄	min-max	x̄	min-max	x̄
Body length, μm	1125-1350		975-1100		950-1200		1175-1225		1100-1200		1000-1200	
Furca L:W	5.25-6.78	6.08	6.11-7.50	6.80	6.10-7.70	7.03	6.00-6.60	6.25	5.00-6.22	5.46	6.00-8.00	6.97
Seta l:L furca	0.28-0.35	0.33	0.27-0.34	0.31	0.28-0.33	0.31	0.27-0.33	0.29	0.29-0.33	0.31	0.26-0.34	0.29
Seta l:Seta ll	0.15-0.17	0.16	0.14-0.18	0.17	0.15-0.18	0.16	0.15-0.19	0.17	0.14-0.17	0.16	0.15-0.18	0.16
Seta l:Seta lll	0.16-0.19	0.17	0.16-0.20	0.18	0.17-0.20	0.18	0.16-0.21	0.18	0.16-0.18	0.17	0.16-0.20	0.17
Seta l:Seta lV	0.75-0.90	0.80	0.85-1.00	0.92	0.85-1.00	0.92	0.80-1.00	0.88	0.84-0.97	0.91	0.85-1.00	0.92
Seta l:Seta V	0.74-0.91	0.84	0.77-0.82	0.79	0.71-0.91	0.76	0.80-0.86	0.84	0.73-0.86	0.77	0.72-0.90	0.81
2EnpP4:												
L art.:W art.	1.77-1.92	1.84	1.67-1.80	1.72	1.67-1.90	1.73	1.57-1.80	1.66	1.62-1.83	1.72	1.58-1.77	1.68
L sp.:L art.	1.00-1.12	1.04	1.00-1.15	1.05	0.98-1.20	1.06	1.02-1.20	1.08	1.04-1.23	1.11	1.04-1.19	1.09
L apical seta: L spina	1.43-1.55	1.49	1.23-1.40	1.34	1.16-1.40	1.30	1.15-1.35	1.26	1.16-1.39	1.25	1.15-1.40	1.23
Number of eggs/egg-sac	–	–	–	–	10-14	13.7	25-29	26.3	13-20	16.6	4.15	5.8



Figs 19-21. *Apocyclops dengizicus* (Lepeschkin), ♀. **19.** P2. **20.** P3. **21.** P4.



Figs 22-31. *Apocyclops dengizicus* (Lepeschkin). **22-25.** ♀. **26-31.** ♂. **22.** Precoxal plate of P2, Lake Tengiz. **23.** The same, vicinitiy of Karshy. **24.** Precoxal plate of P3. **25.** Precoxal plate of P4. **26.** ♂, general view. **27.** 3rd segment of antenna. **28.** Furca. **29.** Endopodite of P4. **30.** Genital and 2nd abdominal segments. **31.** P6.

tation of precoxal plates and armoring of basipodites as in female. Inner seta of P6 shorter than the external one (Figs 30-31).

Distribution. Dobrokhotova (1975) did not mention *A. dengizicus* in her review on the distribution of Cyclopoida in Kazakstan but she informed us (pers. comm.) recently about records of this species in small lakes (salinity 10-12 g/l) in the Turgay Region of Kazakstan and in the small Lake Balkhash-Alakol (now dried) southward from Lake Balkhash (Fig. 1). Chuykov (1993) reported *A. dengizicus* in shallows of the northern part of the Caspian Sea. Sars (1903) recorded *A. dengizicus* – as well as we did – in Lake Tengiz. Studying the samples from the type locality, the Lake Selety-Tengiz (August-September 1987, June 1988) we failed to record *A. dengizicus.*

Ecology. *Apocyclops dengizicus* in Central Asia inhabits mainly ephemeral shallow waterbodies and shallows of some lakes. This species prefers brackish waters.

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A new genus and species of terrestrial amphipod from Isla Mona in the Caribbean Sea

(Crustacea, Amphipoda, Talitridae)

Douglas G. Smith

Smith, D. G. (1998): A new genus and species of terrestrial amphipod from Isla Mona in the Caribbean Sea (Crustacea, Amphipoda, Talitridae). – Spixiana **21/2:** 179-186

A new genus and species of terrestrial amphipod in the family Talitridae is described from Isle Mona, a small island between the islands of Hispaniola and Puerto Rico in the northern Caribbean Sea. The species demonstrates unique characters among talitrid amphipods and is possibly derived from the beachflea genus *Tethorchestia*.

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Introduction

A new genus and species of terrestrial amphipod in the family Talitridae is described. The specimens were collected on Isle Mona, a small island between the islands of Hispaniola and Puerto Rico in the northern Caribbean Sea.

Cariborchestia, gen. nov.

Diagnosis

Sexually dimorphic terrestrial beachfleas inhabiting inland xeric sandy-loam playas (near sea level). Head with large eyes well separated dorsally. Antenna 1 short, not extending beyond proximal margin of last peduncular segment of antenna 2. Antenna 2 geniculate, flagellum with 10 segments. Lacinia mobilis of left mandible 5-dentate, the 5th cusp very reduced, lacinia mobilis of right mandible with large terminal cusps and intervening smaller tubercles on lower ridge, upper ridge margin tuberculate with one large terminal cusp. Maxilliped outer plate with rounded apex densely setose, inner plate apical margin weakly quadrate with two blunt teeth on inner angle and densely setose. Maxilliped palp 3-segmented, segment 3 multi-lobate apically but with no evidence of articulated 4th segment. Gnathopod 1 of female with broad spinose, simple propod, dactyl about one third length of propod. Gnathopod 2 of female basis with sinuous anterior margin, broadest proximally, propod mitten-like, broader distally, dactyl short, subchelate. Pellucid lobes present on propod and carpus. Gnathopod 1 of male subchelate, propod spinose and expanded distally and ventrally with a distinct pellucid lobe, dactyl apposable, length greater than palm. Carpus (segment 5) with well developed pellucid lobe. Male gnathopod 2 strongly subchelate, propod (segment 6) very broad and nearly quadrate. Greater length of palm convex with an inner and outer row of strong spines, dactyl (segment 7) broadly curved with small spines on inner margin. Pereopods cuspidactylate. Pereopods 3 and 4 short and moderately

spinose, dactyl (segment 7) of pereopod 4 with a distinct cusp. Pereopods 5 through 7 similar, slender, pereopod 7 the largest. Gills dissimilar, gill 2 (of gnathopod 2) elongate with a broad mid-length lobe, gills 3 through 5 truncate, broad without lobes, gill 6 largest of gills, elongate and angular without secondary lobes. Epimeral side plates 1 through 3 with spines along ventral margin, pleopods 1 through 3 greatly and equally reduced, with only a single small tubercle on peduncle. Uropods 1 through 3 spinose, uropod 1 without interramal spine; telson broad with apical notch, with marginal and dorsal spines.

Type-species: *Cariborchestia xerophila*, spec. nov.

Cariborchestia xerophila, spec. nov.

Figs 1-43

Types. Holotype: Ovigerous female, 6 mm, part on 2 slides, Playa de Sardinera, Isla Mona [Museum Comparative Zoology (MCZ), Harvard University] – Allotype: male, 6.5 mm, part on 1 slide, same locality (MCZ) – Paratypes: 2 ovigerous females, 2 adult males, 3 slides, same locality (MCZ), 3 females, 3 males, 5 slides, same locality, Museum of Zoology, University of Massachusetts (UMA). Coll. Smith, D.G., Werley, S. (18-20 March 1996, 22-25 July 1996).

Type locality. A shallow dry sea level playa at the base of the cliffs at Punta Arenas, 0.13 km inland of beach, approximate coordinates: 18°04'56"N, 67°56'17"W, Isla Mona.

Description

Female. Length: 5-6 mm (ovigerous).

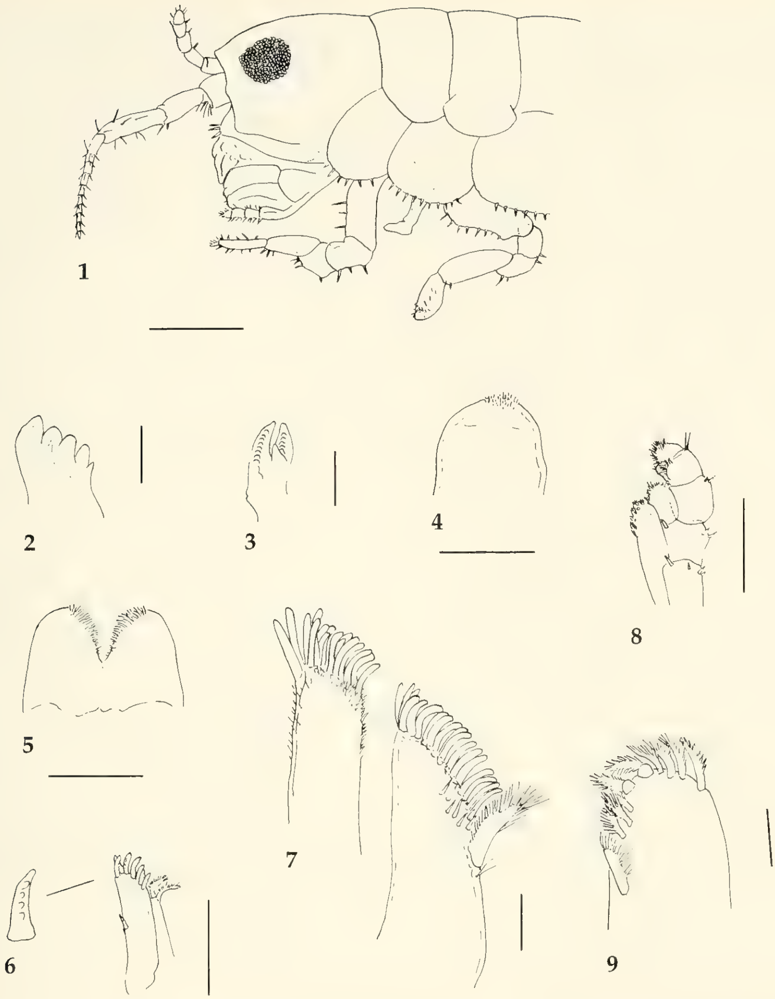
General head morphology and antennae as in genus. Upper lip not broad, rounded distally with an apical patch of hairs. Lower lip bilobed, pilose subapically through medial cleft. Maxilla 1 plate narrow, apically with two plumose setae, outer plate with rudimentary palp, apical margin with seven dentate spines. Maxilla 2 inner plate sinuous, with an oblique apical margin covered with many blunt curved spines extending medially to a single large plumose seta. Subapical face with several stout setae. Outer plate distal face and lateral margins pilose, apical margin with many curved blunt spines. Maxilliped as in genus, segment 2 of palp with a distal medial lobe.

Gnathopod 1. Coxal plate with inner and outer lobes, outer lobe with an oblique ventral margin with spines along anterior ⅔ of margin. Basis (segment 2) distally slightly expanded with posterior and anterior margin spines, propod (segment 6) weakly elliptical with palm poorly defined from posterior margin (non-chelate), posterior margin with double row of stout spines.

Gnathopod 2. Coxal plate quadrate with rounded disto-anterior corner, a strong cusp on posterior margin with a double row of stout ventral spines extending to cusp on posterior margin. Basis (segment 2) broadly expanded on proximal portion with a sinuous anterior margin, anterior margin with eight stout spines. Posterior margin without spines. Carpus (segment 5) with shallow pellucid lobe. Propod (segment 6) with broad pellucid lobe, lateral face with a medial row of spines, dactyl (segment 7) about ½ length of palm (sub-chelate).

Pereopod 3. Coxal plate quadrate, posterior margin with slight biangulation, ventral margin with 14 short spines. Basis (segment 2) expanding distally, posterior margin with 4 spines, anterior margin with 5 spines, merus (segment 4) expanded slightly proximally, with several marginal spines. Carpus (segment 5) and propod (segment 6) subequal in length, marginally spinose. Dactyl (segment 7) nail about ⅓ length of segment, with one anterior marginal spine above nail. Pereopod 4 similar to pereopod 3 but shorter, carpus (segment 5) distinctly shorter than in pereopod 3, dactyl (segment 7) with a distinct median cusp on posterior margin and with a protuberance just above the nail.

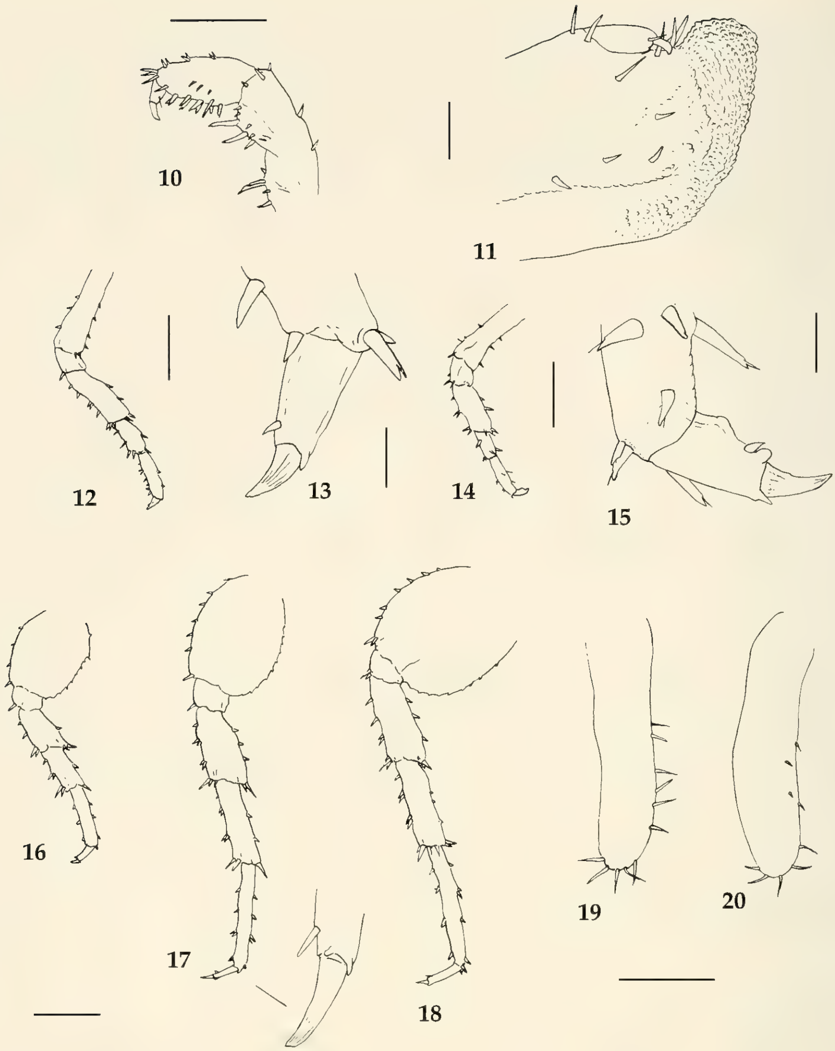
Pereopods 5 through 7. Similar in morphology but differing in size, pereopod 7 the largest, 2 times length of pereopod 5. Basis (segment 2) of pereopod 7 with strong anterior and weak posterior marginal spines, dactyls (segment 7) of pereopods 5 through 7 with a single anterior spine above nail. Oostegites 2 through 5. Linear with rounded distal margins, oostegite 2 with 11 marginal setae, subsequent oostegites with fewer setae. Gills dissimilar, gills 2 and 6 the largest. Gill 2 elongate with a distinct, low secondary lobe at the midpoint of the gill, gills 3 through 5 narrowly triangular in shape, gill 5 the broadest of the three, gill 6 the largest, elongate and slightly twisted, angular but without secondary lobes.



Figs 1-9. *Cariborchestia xerophila*, gen. nov., spec. nov. Female anterior habit and associated appendages. **1.** Habit showing general morphology including eye and antennae. **2.** Left lacinia mobilis. **3.** Right lacinia mobilis. **4.** Upper lip. **5.** lower lip. **6.** Maxilla 1, outer and inner plate, dentate spine enlarged to left. **7.** Maxilla 2 outer and inner plates. **8.** Distal half of right maxilliped. **9.** Inner plate of maxilliped. Scales: **1:** 0.5mm; **2, 3, 7, 9:** 0.05 mm; **4, 5, 6, 8:** 0.25 mm.

Epimeral plate 1. With an oblique ventral margin, with three ventral spines, epimeral plate 2 quadrate, with 6 spines on ventral margin and 3 small spines on posterior margin, epimeral plate 3 broadly quadrate with a distinct disto-posterior angle, ventral margin with eight spines, posterior margin with 5 small spines. Pleopods 1 through 3 very reduced, peduncle with 3 (2-4) small subapical marginal spinules, rami vestigial, represented by a single tubercle-like segment with a single terminal seta.

Uropod 1 penduncle. With dorsal spine rows, inner row with 3 proximal and 2 distal spines, outer row with 5 spines, inner ramus with 3 dorsal spines and 4 (3-5) terminal spines, outer ramus without spines. Uropod 2 peduncle with 4 (3-5) dorsal spines, rami subequal in length with 2 (2-3) dorsal spines and 3 (2-4) terminal spines. Uropod 3 peduncle with 2 dorsal spines, ramus with 4 (3-4) terminal spines. Telson broadly elliptical, wider than long with a slight apical notch, disto-lateral margin with 13 (11-14) spines, dorsal surface with 2 spines, each near lateral margin.

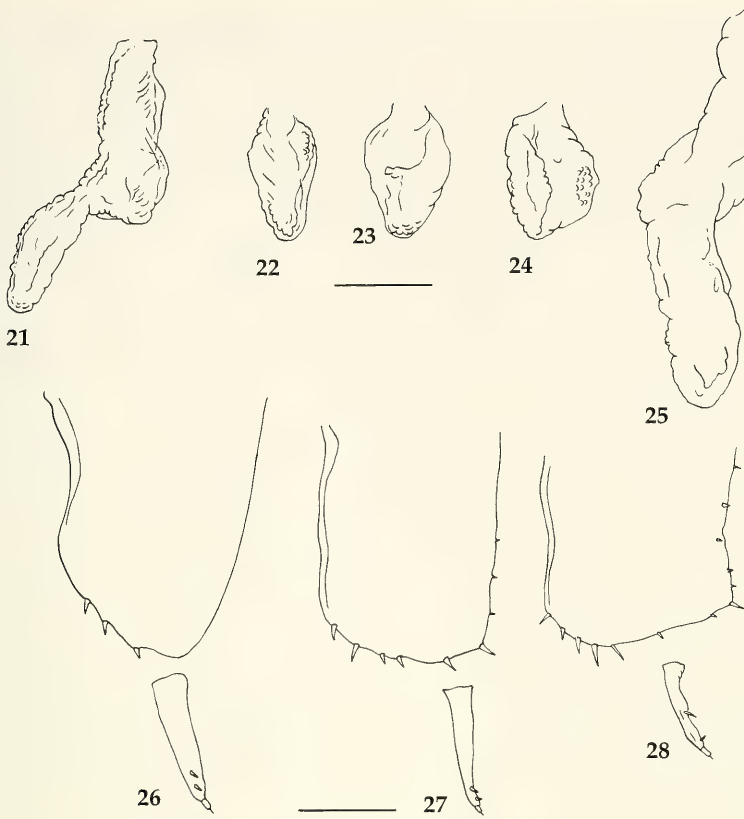


Figs 10-20. *Cariborchestia xerophila*, gen. nov., spec. nov. Female thoracic appendages. **10.** Gnathopod 1. **11.** Gnathopod 2, Propod and dactyl. **12.** Pereopod 3. **13.** Enlargement of dactyl of pereopod 3. **14.** Pereopod 4. **15.** Enlargement of dactyl of pereopod 4. **16.** Pereopod 5. **17.** Pereopod 6, enlargement (X4) of dactyl below. **18.** Pereopod 7. **19.** Oostegite 2. **20.** Oostegite 3. Scales: **10, 19, 20:** 0.25 mm; **11, 13, 15:** 0.05 mm; **12, 14, 16-18:** 0.5 mm.

Male. Length: 5-6.5 mm.

Demonstrating characters of the genus and female. Different (sexually dimorphic) from the female in the following ways: gnathopod 1 subchelate, carpus (segment 5) with a pronounced pellucid lobe on disto-posterior margin with several spines around base of lobe. Propod (segment 6) expanded distally with a distinct pellucid lobe, disto-lateral surface with several spines, dactyl (segment 7) about ⅔ length of palm of propod.

Gnathopod 2 basis (segment 2). Constricted proximally, lateral margins distally parallel, posterior margin with 3 (3-4) small spines, anterior margin with 5 small spines on distal ⅔ of margin. Propod (segment 6) greatly enlarged, quadrate, powerfully subchelate, palm margin with a slight concavity near insertion of dactyl, otherwise strongly convex and spinose, with a row of unnotched spines on



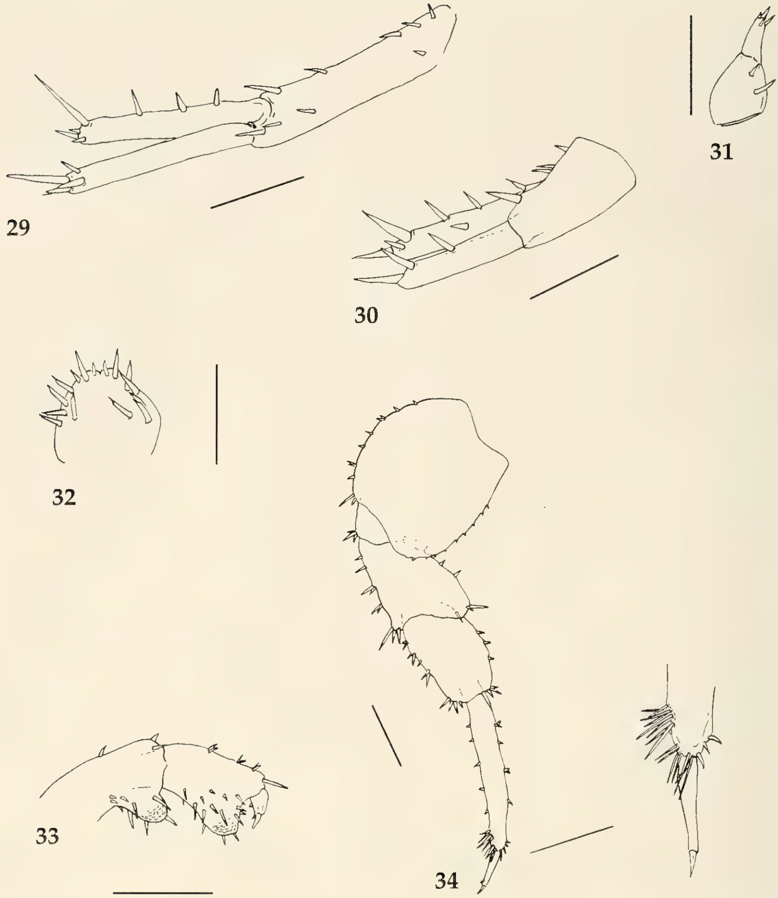
Figs 21-28. *Cariborchestia xerophila*, gen. nov., spec. nov. Female gills and epimera with corresponding pleopodia. **21.** Gill 2. **22.** Gill 3. **23.** Gill 4. **24.** Gill 5. **25.** Gill 6. **26.** Epimeron 1. **27.** Epimeron. **28.** Epimeron 3. Scales equal 0.25 mm.

either side of occlusal surface, both spine rows comprised of alternating long and short spines. Dactyl (segment 7) curved, extending beyond disto-posterior corner of propod, occlusal surface with a row of small spines.

Pereopod 6 merus (segment 4). Slightly expanded distally. Pereopod 7 merus (segment 4) broad and expanded distally, carpus (segment 5) broad, each segment with several anterior and posterior marginal spines. Propod (segment 6) with discontinuous patches of long, thin spines and setae along antero-distal and distal margin.

Discussion
Ecology

The nature of the inland habitats of Isla Mona, including the area where the specimens described in this paper were collected, has been discussed by Smith and Wier (In review). Specimens of *C. xerophila* were collected in pit fall traps with insects in the following orders (families); Coleoptera (Scolytidae, Staphylinidae), Collembola (Hypogastruridae, Entomobryidae), Dermaptera (Cabiidae), Hymenoptera (Formicidae), and Orthoptera (Gryllidae, Gryllacrididae). Also, a species of the mite family Oribatidae was in the collections. *Cariborchestia xerophila* collected in March were mostly juveniles. A single adult ovigerous female in sample contained 3 eggs. Collecting in July produced 18 subadult and adult males and 20 subadult and adult females, ovigerous females contained 2-3 eggs.



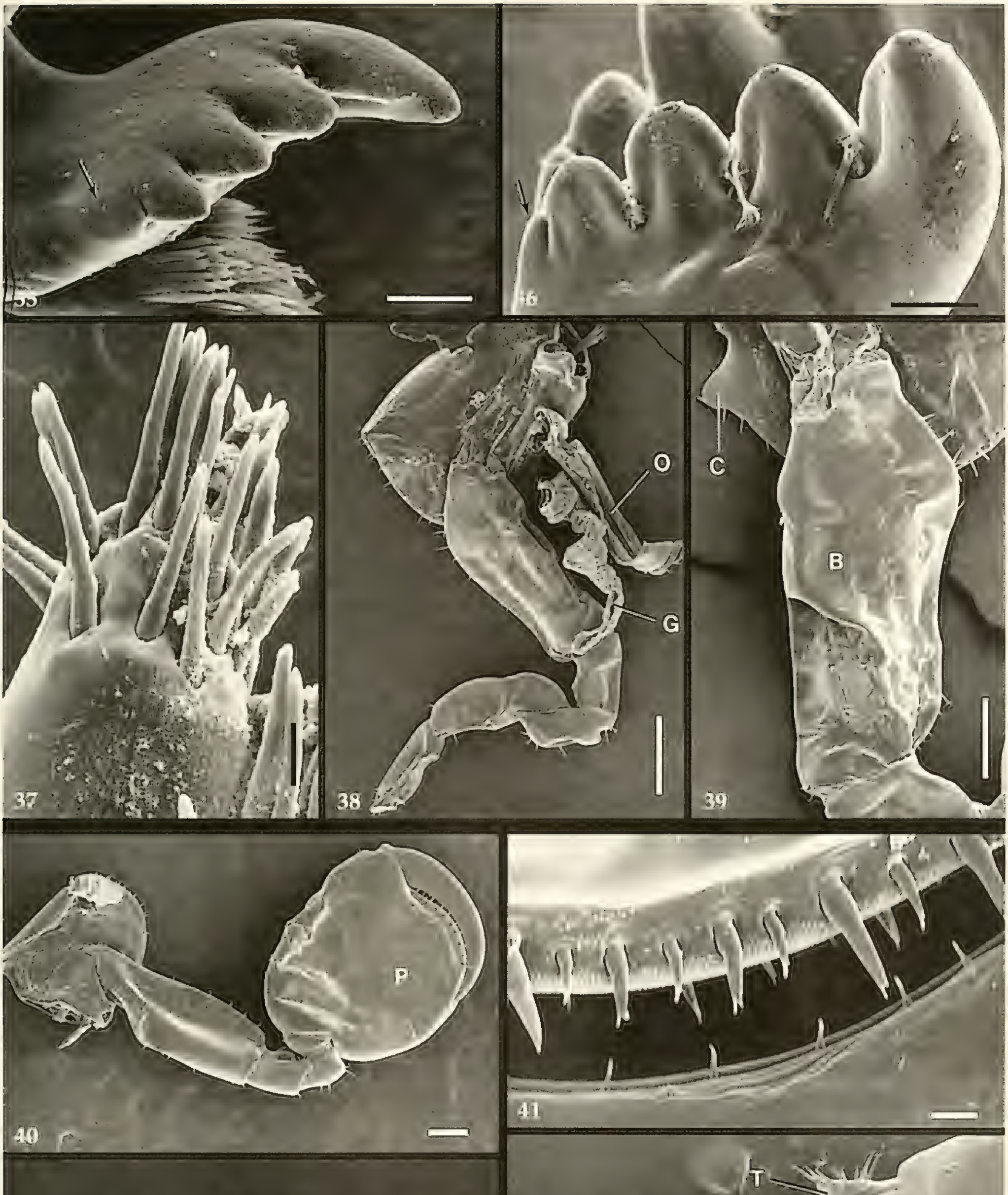
Figs 29-32. *Cariborchestia xerophila*, gen. nov., spec. nov. Female urosome appendages. **29.** Uropod 1. **30.** Uropod 2. **31.** Uropod 3. **32.** Telson. **Figs 33-34.** Allotype male. **33.** Gnathopod 1. **34.** Pereopod 7, distal propod margin and dactyl enlarged (X2.5) to right. Scales: **29-33:** 0.25 mm; **34:** 0.5 mm.

Relationships

Cariborchestia xerophila is presently known only from Isla Mona and is possibly endemic to the island. The species contains several characters which make it clearly distinct among described talitrid genera. *Cariborchestia* is unique in the possession of spines developed along the ventral margin of epimera 1-3 (Figs 26-28). The species is classified among the non-substrate modifying cuspidactylate beachfleas (Bousfield, 1984) as it possesses a 5-dentate left lacinia mobilis (Figs 2, 35, 36) but clearly is terrestrial in habit both in its location on the island and the presence of enlarged complex gills (Figs 21, 25) and

Figs 35-39. *Cariborchestia xerophila*, gen. nov., spec. nov. Female feeding appendages and gnathopod 2. **35-36.** Left lacinia mobilis, arrows denote reduced 5th tooth. **37.** Segment 3 of maxilliped palp. **38.** Gnathopod 2, G=gill 2, O = oostegite 2. **39.** Gnathopod 2, B = basis (segment 2), C = cusp on posterior margin of coxal plate. Scales: **35-37:** 0.01 mm; **38:** 0.25 mm; **39:** 0.1 mm.

Figs 40-43. *Cariborchestia xerophila*, gen. nov., spec. nov. Male appendages. **40.** Gnathopod 2, P=propod (segment 6). **41.** Enlargement of palm of propod and dactyl (segment 7) occlusal margin. **42.** Pleopod 1 with simple terminal tubercle (T). **43.** Urosome with uropods 1-3 and telson (T). Scales: **40:** 0.1 mm; **41, 42:** 0.01 mm; **43:** 0.25 mm.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highly reduced pleopodia (Figs 26-28, 42), each a strong indication of terrestriality (Hurley 1968, Friend & Richardson 1986). The fifth cusp of the lacinia mobilis in *C. xerophila* is reduced in size and thus would thus be treated as vestigial in the genus using Bousfield's (1982, 1984) scheme for the evolution of the family. The combination of strong sexual dimorphism in male gnathopods (Fig 40) and pereopod7 (Fig 34) and non-ramate pleopodia 1-3 can not be found in any other known beachflea genus including the otherwise similar genus *Macarorchestia* recently described from caves in the Azore Island group (Stock 1989).

Two somewhat similar genera, *Macarorchestia* discussed above and *Platorchestia* from northern Pacific beaches with sexually dimorphic gnathopods and pereopod 7, are geographically remote from *Cariborchestia* and are suggested to have separate origins. Lindeman (1991) citing recent geological investigation on the origin of the West Indian islands developed an historical perspective on the origin of terrestrial amphipods in the Central American and Caribbean regions. Lindeman (1990, 1991) determined using morphological study and parsimony methods that the landhopper genera *Caribitroides* and *Cerrorchestia* from Central America and Jamaica arose from a palustral ancestor close to the palustral *Chelorchestia*. Following Lindeman's (1991) hypothesis, *Cariborchestia* would have evolved from some as yet undiscovered or extinct palustral ancester, inhabiting either brackish mangrove swamps or formerly occurring fresh water habitats. Smith and Wier (in review) have postulated the occurrence of permanent freshwater during the island's history as suggested by the existence of a surface derived cave dwelling species of shrimp.

Despite the attractiveness of Lindeman's (1991) theory, *Cariborchestia* does not appear to be closely related to either *Caribitroides* or *Cerrorchestia* morphologically or ecologically (see Lindeman, 1990, for descriptions of these genera) and would appear to have had a different origin. An alternative hypothesis suggests that the ancestors of *Cariborchestia* possibly were part of the proto-antillean supralittoral beachflea fauna represented today in the region by *Tethorchestia* with which *Cariborchestia* shares several characters especially the unique features of the development of spines and setae on the propod (segment 6) of pereopod 7 in the male (Fig 34).

Acknowledgements

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Stock, J. H. 1989. A new genus and species of Talitridae (Amphipoda) from a cave in Terceira, Azores. – J. Nat. Hist. **23:** 1109-1118

10. Elgood, J. et al.): The Birds of Nigeria. British Ornithologist's Union Check-list No. 4 (2. Aufl.). 1994. B.O.U., Akeman Street, Tring, Herts. HP23 6AP; U.K. 306 S., 16 Habitat- und 48 Vogelfarbtafeln. ISBN 0-907446-16-7.

Mit einem Westafrika-Vogelführer und dieser Liste wird man in Nigeria bei ornithologischen Exkursionen klarkommen. Noch gibt es ja für die eng aneinandergrenzenden Staaten im Golf von Guinea keine eigenständigen Vogelführer.

John Elgood, lange Dozent für Zoologie in Ibadan, hat in hohem Alter, unterstützt von weiteren fünf hinzugerufenen Autoren, die erstmalig 1981 erschienene Checkliste komplett überarbeitet. Neu sind alle Farbabbildungen, beginnend mit einer hübschen gemalten Farbtafel des einzigen Endemiten, des Ibadanwebers *Malimbus ibadanensis*, über die typischen Habitate des Landes (verschiedene, teils degradierte Savannen, Berggrasland, Regenwald) bis hin zu Nahaufnahmen teils spektakulärer Arten wie Flaggenflügel und Buntkopf-Felshüpfer.

Nach Artname und Status gibt es zu jeder der inzwischen 884 registrierten Arten die Häufigkeitsangabe, knappe Verbreitung innerhalb Nigerias sowie Quellen nebst Beobachtern, sehr sorgfältig im Literaturverzeichnis dokumentiert. Das Einschwenken auf die neue Nomenklatur des Handbuchs "Birds of Africa" zeigen die im Anhang gegenübergestellten neuen und alten wissenschaftlichen und englischen Namen. Neben gründlicher Einführung in Geographie, Klima und Vegetation begrüßt man die neu gegründete "Nigerian Conservation Foundation", die sich wohl als einzige um den Artenschutz bemüht. Diese klar gegliederte, flüssig und nicht trocken geschriebene Artenliste wird vielen in dieser Region eine Unterstützung sein. T. Mischler

11. Clement, P., A. Harris & J. Davis: Finches & Sparrows. An Identification Guide. – Chr. Helm, London 1993. 500 S., 73 Farbtafeln. ISBN 0-7136-8017-2.

Dieses Bestimmungsbuch umfaßt die Familien der Finken, Prachtfinken und Sperlinge (Fringillidae, Estrildidae und Passeridae) der Welt, insgesamt 290 Arten. Die Aufmachung ist in fast schon gewohnter erstklassiger Qualität der "Helm"- Familienmonographien: hervorragende Vogeltafeln (hier 950 Einzeldarstellungen, manche kaufen das Buch allein deshalb), gegenübergestellt Verbreitungskarte und Kurzcharakterisierung der Geschlechter- und Jugendkleider, im eigentlichen Text dann minutiöser beschrieben, dort weiter Angaben zu Rassen, Stimme, Status, Lebensraum, Verhalten und genauer Verbreitung; viele Flugbilder (von oben) im Text eingestreut.

Wer weiß, wie schwierig die afrikanischen Girlitze und die himalayanischen Rosengimpel farbig darzustellen sind, damit sie artlich trennbar erscheinen, kann die Arbeit der preisgekrönten Künstler Harris und Davis erst voll schätzen. Die Tafeln sind ungetrübter Genuß und Kernstück des Werkes; der präzise Text im Kleindruck steht ihnen aber kaum nach. Das Buch ist mehr Nachschlagewerk denn Feldführer, so kann auch der Finkenvogelhalter schnell bei "seiner" Zielgattung fündig werden. Den 1992 (von 2 Bälgen aus 1929 nachträglich) neubeschriebenen *Leucosticte sillemi* reiht Clement bei *L. brandti* ein, vielleicht nicht zu Unrecht, da man diese Form erst einmal lebend finden sollte. *Lonchura pallidiventer*, 1996 aus Borneo beschrieben, wird aber hoffentlich in einer 2. Auflage aufgenommen werden. "Finken und Sperlinge" wird noch lange Jahre Standardwerk bleiben, wofür man Verlag und Autoren nur beglückwünschen kann. T. Mischler

12. Karsholt, O. & J. Razowski: The Lepidoptera of Europe, a distributional Checklist. – Apollo Books, Stenstrup 1996. 380 S., hardbound, mit CD-ROM.

Nach dem Abschluß der 12 Jahre währenden redaktionellen Arbeiten erhält der europäische Lepidopterologe in Form der ersten modernen Lepidopteren-Checkliste unseres Kontinentes nun endlich die unverzichtbare Grundlage seines künftigen Schaffens. Sie ist bei Apollo Books, Kirkeby Sand 19, DK-5771 Stenstrup, erhältlich. Die von einem namhaften Autorenkollegium (40 Autoren!) zusammengestellte und zuletzt federführend von Ole Karsholt redigierte Checkliste charakterisiert in Tabellenform die Verbreitung von 8.470 Schmetterlingsarten geordnet nach 31 Europäischen Staaten. Die nach Osteuropa reichenden Verbreitungsareale mußten hierbei wegen Forschungsdefiziten etwas stiefmütterlich behandelt werden, so daß das immense Gebiet der Ukraine, Weißrußlands und des europäischen Teiles Rußlands unter dem Kürzel "EE" (=Eastern Europe) zusammengefaßt wurde. Die Daten werden (im Preis inbegriffen) auch auf CD-ROM geliefert und sind von dieser leicht auf alle modernen Textverarbeitungs- und Datenbank-Systeme zu konvertieren. Die Herausgeber sind sich natürlich des Umstandes bewußt, daß sowohl in der Taxonomie als auch in der Faunistik der europäischen Schmetterlinge noch vieles ergänzt und berichtigt werden muß. Gerade hierfür ist das vorliegende Werk jedoch "Gold wert": Endlich kann man auf einer modernen gemeinsamen Grundlage eine kontinuierliche Fortschreibung der europäischen Lepidopterenfauna beginnen. A. Hausmann

13. Storch, V. & U. Welsch: Kükenthals Leitfaden für das Zoologische Praktikum, 22. neubearbeitete Auflage. – Gustav Fischer Verlag, Stuttgart, Jena, Lübeck, Ulm, 1996, 482 S.

Dieses bewährte Buch hat inzwischen zahllose Generationen von Biologie-Studenten durch das Grundstudium begleitet und wird diese Funktion auch durch die Neuaflage weiterhin ünbernehmen. Es bleibt zu wünschen, daß die Überarbeitungen und Zusätze, wie die Larvenstadien einzelner Gruppen und die Präparationsanleitung für den Tintenfisch *Loligo vulgaris* entsprechend gewürdigt werden. Bedauerlicherweise wird diese Zusammenfassung, die das Tierreich nur exemplarisch vorstellen kann, in den Studiengängen vielfach die einzige Informationsquelle über die Morphologie, Anatomie und Systematik bleiben, obwohl diese "nur" als Grundlageninformation gedacht war. Es bleibt den Anwendern zu wünschen, daß diese in besonderer Weise präsentierten Basisdaten zu weiterem intensivem Studium der tierischen Organismen und der Zusammenhänge der Entwicklung und Evolution der Organe führen und den Grundstein liefern. Die Präsentation von einzelnen Präparationsobjekten im Grundpraktikum sollte nicht das Ende der Beschäftigung mit den hier vorgestellten Tieren und morphologischen Strukturbeschreibungen sein, sondern Informationen liefern, die die Neugierde auf weitere Zusammenhänge der Tiere und ihrer Anatomie wecken. E.-G. Burmeister

14. Ax, P.: Multicellular Animals. A New Approach to the Phylogenetic Order in Nature, Vol. I. – Springer 1996, 225 S.

Bei dem vorliegenden Buch handelt es sich um die englische Übersetzung der 1995 erschienenen deutschen Fassung "Das System der Metazoa" vom gleichen Autor. Die Kritikpunkte zu diesem ersten Band, der neben den Grundlagen der phylogenetischen Systematik vor allem die Verwandschaft der Mesozoa, Porifera, Placozoa, Cnidaria, Ctenophora, Gnathostomulida, Plathelminthes und Nemertini dokumentiert, sind auch hier deutlich. Zwar werden hier im streng cladistischen Sinn die klassischen Kategorien wie Stamm, Klasse, Ordnung aufgelöst und die Hierarchieebene mit zahllosen neuen Namen in streng dichotomer Abfolge versehen, doch dient dies in keiner Weise der Übersichtlichkeit. Auch nicht durch Autapomorphien belegte Gruppen, die historisch durch Merkmalskomplexe eingeführt sind, bedürfen der Erwähnung, da diese in der Zusammenschau mit anderen systematischen Werken zu sehen sind. Zudem stellt der Autor in Selbstüberschätzung das von ihm vorgestellte System als endgültig dar und läßt Diskussionen über die Zuordnung kaum zu. Gerade die Plathelminthes, die Ax besonders hervorhebt, sind ein klassisches Beispiel für die anhaltende kontroverse Diskussion der Systematik. Auch diese Fassung ist ein interessanter Beitrag zur Systematik der Niederen Wirbellosen, der 'Appetit' auf die folgenden Bände macht. Als Lehrbuch ist diese alledings kaum geeignet, da Zusatzinformationen zu den übrigen Abhandlungen fehlen. Unverständlich ist die Flächenbeanspruchung der Abbildungen, Grafiken und der großen Lettern, die den Preis mitbeeinflussen. E.-G. Burmeister

15. Tittizer, T., Krebs, F. (Hrsg.): Ökosystemforschung: Der Rhein und seine Auen – Eine Bilanz. – Springer-Verlag Berlin Heidelberg 1996, 468 S.

Der Rhein, Urstrom im Westen Deutschlands, wird hier in einer Studie vorgestellt, wobei die anthropogene Beeinflussung in historischer wie gegenwärtiger Zeit besonders herausgestellt wird. Die Herausgeber repräsentieren das Bundesamt für Gewässerkunde in Koblenz, das im Auftrag des zuständigen Bundesministeriums in jahre- bzw. jahrzehntelanger Arbeit die Daten zu diesem Fluß zusammengetragen haben. So werden Geomorphologie und Hydrographie, die nicht-stofflichen (4000 v.Chr - heute) und stofflichen (1800 bis heute) Einflüsse und deren Belastungskomponenten, sowie die Lebensgemeinschaften des Rheins vorgestellt. Letztere werden in Auzonen mit terrestrischen Elementen und den aquatischen Biozönosen gegliedert. Besonders aufschlußreich sind die Schlußfolgerungen und Empfehlungen, die jedoch politischen Kriterien unterworfen zu sein scheinen. Ein Kapitel zum Indikationswert einzelner Organismen ist sehr kritisch zu werten, da auf Verlustraten aufgebaut wird. Zudem fehlen hier Literaturangaben der im gesamten Buch sehr unterrepräsentierten Glieder des Makrozoobenthos. Ansonsten findet der Leser hier eine Fülle von Informationen und Analysen zu diesem Flußsystem, das zu den belastetesten der Welt gehört. Das Literaturverzeichnis gibt eine Vielzahl von Bezugsquellen an, die auch auf zwei beigelegten Disketten gespeichert sind. E.-G. Burmeister

16. Gisi, U., Schenker, R, Schulin, R., Stadelmann, F.X. & H. Sticher: Bodenökologie. – Georg Thieme Verlag Stuttgart, New York 1997, 350 S.

Diese 3. neubearbeitete Auflage des namhaften Autorenkollektivs aus der Schweiz enthält in bewährter Weise die Dokumentation zu den ungestörten Böden, deren interaktiven Prozesse abiotischer und biotischer Faktoren sowie den Auswirkungen menschlicher Eingriffe auf den Boden. Dabei wird auch den Schadstoffwirkungen im Themenkomplex besonderer Aussageanteil eingeräumt. Dem Bodenschutz werden auf drei Seiten massive Forderungen zu Grunde gelegt. Allerdings läßt sich gerade hier die Herkunft einiger Autoren aus der Chemischen Industrie wie auch in anderen Kapiteln nicht verleugnen. Ansonsten sind hier eine Fülle von Grundlagen präsentiert, wie sie sonst nur durch Studium zahlreicher Literaturstellen möglich wären. Der Boden, als Lebensraum in seinem Funktionsgefüge, wird hier auch dem Lernenden nähergebracht mit einer breiten Palette von Daten.

E.-G. Burmeister

17. Waringer, J. & W. Graf: Atlas der Österreichischen Köcherfliegenlarven – unter Einschluß der angrenzenden Gebiete. – Facultas Universitätsverlag Wien, 1997. 286 S.

Die merolimnischen Köcherfliegen bieten im aquatischen Larvenstadium immer noch eine Fülle von Determinationsproblemen. So sind Dokumentationen notwendig, auch wenn diese auf kleinere zoogeographische Regionen bezogen sind, zumal einige Arten und speziell deren Larven vielfach als Indikatoren für Gewässerbeurteilungen herangezogen werden. Auf die Strittigkeit dieser Indikationen in Abhängigkeit von Verbreitungstyp wird hier nicht eingegangen. In dem vorliegenden Bestimmungsschlüssel werden die bekannten Köcherfliegenlarven Österreichs und angrenzender Gebiete durch eine dichotomen Bestimmungsschlüssel mit Farbabbildung der anatomischen Merkmale vorgestellt. Dabei werden nur die letzten Larvenstadien berücksichtigt, ohne daß deren Erkennung beschrieben wird. Eine kleine Larve einer kleinen oder großen (!?) Art ist darum nicht zuzuordnen. Auch fehlen Hinweise zu verwendeten Begriffen im einleitenden Teil, die die Benutzung nur dem Fachmann möglich machen. Die Schlüssel und Diagnosen entstammen vielfach der Übersetzung von Sedlak, E. (1985/87) durch J. Waringer und wurden ausschließlich hier durch Farbabbildungen erweitert. Diese sind in ihrer aufwendigen Gestaltung unnötig und auch vielfach nicht artspezifisch zuzuordnen. Insgesamt ist dieser "Arbeitsatlas" von seiner Aussagekraft unter Einbeziehung der Darstellungswerte kritisch zu beurteilen. Der Preis ist zudem eine Zumutung und huldigt den sicher guten Farbabbildungen, nicht aber dem Inhalt.

E.-G. Burmeister

18. Klausnitzer, B.: Käfer im und am Wasser. – Die Neue Brehm Bücherei 567, Spektrum Akademischer Verlag, Magdeburg, 1996. 200 S.

Der beste Kenner der hollimnischen und amphibisch lebenden Käfer hat hier sein viel verwendetes Werk neu bearbeitet (1. Auflage 1984, Die Neue Brehm-Bücherei). Dabei wurden zahlreiche detailanatomische Darstellungen hinzugefügt und die Habitatbindungen einiger Arten ergänzt. Dabei ist jedoch herauszuheben, daß der überwiegende Teil der Bestimmungstabellen Determinationen nur bis zur Gattung zuläßt. Bedauerlicherweise sind auch hier den Hydroporinae, der artenreichsten Gruppe der Schwimmkäfer, keine Gattungsdiagnosen zugeordnet. Ansonsten enthält dieses Bändchen eine Fülle biologisacher Details in Verbindung mit den morphologischen Merknalen zur Analyse der taxonomischen Einheit. Dies wird auch zukünftig diesen Band der herausragenden neu gestalteten Reihe der Brehm Bücherei zum unverzichtbaren Handwerkszeug für den Einsteiger in Sachen Wasserkäferfauna machen.

E.-G. Burmeister

19. Suhling, F. & O. Müller: Die Flußlibellen Europas.- Die Neue Brehm Bücherei 628, Spektrum Akademischer Verlag Magdeburg 1996, 237 S.

Die Flußlibellen – Gomphidae – stehen im Mittelpunkt der Libellenkunde in Mitteleuropa, die im Vergleich zu anderen Insektengruppen, neben Schmetterlingen und Käfern, zu den herausragenden Zielgruppen von Forschung und Liebhaberei gehören. Diese besonders durch Verbauungen unserer mitteleuropäischen Fließwassersysteme und die dadurch veränderten abiotischen und biotischen Faktoren in Mitleidenschaft gezogene Tiergruppe wird hier in eindrücklicher Weise vorgestellt und ihre Lebensbedingungen werden beschrieben, wobei allgemeine mit speziellen Aspekten kombiniert werden. Der Bestimmungsschglüssel der Larven ("Exuvien") wie der Imagines ist eine wesentliche Hilfe für die Feldarbeit. Unverzichtbar ist die Präsentation der Lebenszyklen, der Lebensräume und der Gefährdungen bzw. des Schutzes dieser augenfälligen und leider so selten gewordenen Fluginsekten, wie deren wasserlebenden Larven mit hochinteressanter Biologie. Der norddeutsche Bezug wird dabei jedoch immer wieder deutlich. Andererseits werden auch die nordafrikanischen und vorderasiatischen Arten vielfach miteinbezogen.

E.-G. Burmeister

20. Jödicke, R.: Die Binsenjungfern und Winterlibellen Europas.- Die Neue Brehm-Bücherei 631, Westarp Wissenschafen Magdeburg 1997, 277 S.

Dieser den Lestidae gewidmete Band der Neuen Brehm Bücherei zeigt erneut eine herausragende und umfassende Dokumentation, die hier mit einfachen Mitteln und zum angemessenen Preis erreicht wird. Die behandelten Kleinlibellen, unter denen die Winterlibellen der Gattung *Sympecma* in ihrer Phänologie auffällige Besonderheiten zeigen, werden in ihren morphologischen und biologischen Details vorgestellt. Zu jeder Art Mitteleuropas ist ein besonderer Steckbrief entwickelt worden, der Fakten zur Taxonomie, Nomenklatur, Imago-Beschreibung, Merkmale der Exuvie, Verbreitung, Lebensraum und Flugzeit enthält. Allgemeine Übersichten erfolgen im abschließenden Teil zur Eientwicklung, Larvalphase, Jungfern- und Reifeflug und Verhalten während der Geschlechtsreife und zu den Feinden der erwachsenen Tiere. Umweltfaktoren werden jederzeit einbezogen, die auch im Abschnitt zu Gefährdung und Schutz im Vordergrund stehen. Der Autor hat hier eine Auswahl sehr artbezogener Daten der 8 in Europa verbreiten Arten zusammengestellt und in umfassender Weise dokumentiert sowie durch Abbildungen bereichert.

E.-G. Burmeister

21. Dobler, G.: Krankheit durch Zecken. Wie gefährlich sind Zecken wirklich ? – Edition medipharm Stuttgart 1997, 63 S.

Zecken, diese ungeliebten Blutsauger, haben in den letzten Jahren Schrecken in dem ansonsten von Krankheitsüberträgern gereinigten Mitteleuropa ausgelöst. Die Informationen über die Übertragung der Frühsommer-Meningoenzephaltis (FSME) und der Lyme-Borelliose sind inzwischen weit verbreitet, was jedoch nicht alle Ärtze zur Kenntnis genommen zu haben scheinen. Dem intraovarialen Infektionsweg, bei dem die Parasiten für Zecke und Mensch sowie Haustiere von der Zeckenmutter auf die Eier übertragen werden, wird leider immer noch zu wenig Aufwerksamkeit geschenkt, obwohl gerade diese Bedingungen zur epidemieartigen Ausbreitung der Krankheiten führen kann. Auch dieses Bändchen wiederholt die bisherigen populärwissenschaftlichen Kenntnisse. Die Hinweise zur Erkennung und Prophylaxe sollten dieses Heftchen jedoch zum Bestand jeder Arztpraxis machen und der gesamten Bevölkerung, die sich in einer Industriegesellschaft von Infektionen sicher zu sein glaubt, zugänglich gemacht werden.

E.-G. Burmeister

22. Hintermeier, H. & M. Hintermeier: Bienen, Hummeln, Wespen im Garten und in der Landschaft. – Bayerischer Landesverband für Gartenbau und Landespflege e.V., Obst und Gartenbauverlag München, 1994. 116 S., 138 farbige Abb., 29 Zeichnungen. ISBN 3-87596-098-X (broschiert): ISBN 3-87596-099-8 (geb.).

Die reich bebilderte Broschüre wendet sich an Gartenbesitzer, Imker, Freizeitentomologen, Schüler und Naturfreunde. Anhand ausgewählter Hautflüglergruppen (Sozial- und Solitärbienen sowie Sozial- und Solitärwespen) wird ein informativer Einblick in die umfassende ökologische Bedeutung dieser Insekten gegeben. Nach einem geschichtlichen Abriß über die Honigbiene und Ausführungen zu ihrer Bedeutung als wichtiges Bestäubungsinsekt wird zu den Hummeln übergeleitet. Ausführlich wird die Biologie von *Bombus*-Arten behandelt und ihre besondere Funktion als Bestäuber vieler Wild- und Kulturpflanzen erklärt, die sie für die Landwirtschaft unentbehrlich macht. Zugleich werden Möglichkeiten erörtert, wie die interessanten Tiere, die größtenteils als sehr bedroht auf der "Roten Liste" stehen, geschützt werden können, um so zum Erhalt ungeschützter Biotope beizutragen. Im Kapitel über die Solitärbienen sind neben biologischen Fakten ebenfalls Maßnahmen für deren Schutz ein vordringliches und wichtiges Thema. In diesem Sinne sind auch die Ausführungen über das

Leben der Wespen und besonders der Hornissen gedacht. Wespen tragen durch das Verfüttern von Insekten an ihre Brut wesentlich dazu bei, die Natur im Gleichgewicht zu halten.

Interessant wird das Büchlein durch die jedem Kapitel angefügten Informationen über Schutz- und Fördermaßnahmen, begleitet von Beschreibungen und Bauanleitungen für verschiedene "künstliche" Nistgelegenheiten, um die Tiere an einen bestimmten Lebensraum zu binden. In dem nach Themenkreisen gegliederten Literaturverzeichnis finden sich zusätzliche Quellenangaben für weiterführende Studien. Besonders wertvoll wird die Broschüre dadurch, daß die dargestellten Hautflügler durch den fundierten Text zu Sympathieträgern werden. Die überkommenen Vorurteile von stechenden, gefährlichen Monstern werden abgebaut und statt dessen wird vermittelt, daß man Bienen und Wespen nicht zu fürchten braucht, sondern lernen soll, mit ihnen zu leben, sich an ihnen zu erfreuen und ihren Nutzen für die Natur zu erkennen. E. Diller

23. Pulawski, W. J.: The Wasp Genus *Gastrosericus* Spinola, 1839 (Hymenoptera: Sphecidae). – Memoirs of the California Academy of Sciences Nr. 18. California Academy of Sciences, Philadelphia, 1995. 173 pp. ISBN 0-940228-36-X.

The genus *Gastrosericus* is revised for the first time. 61 species are recognized. The revision includes redescriptions of the genus and several species, a summary of known behavior as well as original observations, differential diagnoses and descriptions of all species, illustrations, geographic records, distribution maps, identification keys, and analysis of phylogenetic relationships among the species. Numerous, previously unnoticed characters are used in keys, diagnoses, species descriptions, and analyses. Besides, twenty-seven new species are described.
E. Diller

24. Watsham, A. & G. Prinsloo: Ink Drawings and Watercolours of African Chalcid Wasps.- Isteg Scientific Publications, Irene, South Africa, 1995. 36 S., 4 Farbtafeln, 19 Federzeichnungen. ISBN 0-620-19196-1.

A. Watsham als Zeichner und G. Prinsloo, der Verfasser der Texte, wollen mit dem in DIN-A4 Querformat gehaltenen Büchlein mit einer Auflage von nur 600 Exemplaren auf die Schönheit afrikanischer Erzwepen hinweisen, die wegen ihrer Kleinheit zumeist übersehen werden. Dem Forst- und Landwirt wie auch dem angewandten Entomologen ist die für die biologische Schädlingsbekämpfung wichtige, sehr artenreiche Parasitenfamilie jedoch wohl bekannt. Die kleine Auswahl dieser Insekten in der vorliegenden Veröffentlichung soll deren große Variationsbreite in oft bizarren Gestalten veranschaulichen. Die gekonnten, detailgenauen, sehr schönen Darstellungen dürften durchaus als Vorlage für hervorragende Insektendarstellungen dienen.
E. Diller

25. Seifert, B.: Ameisen: beobachten, bestimmen. – Naturbuch-Verlag, Augsburg, 1996. 552 S. ISBN 3-89440-170-2.

Durch die im Tierreich einmalige, hohe Entwicklung ihrer Sozialstrukturen haben Ameisen in unseren Ökosystemen bedeutende Funktionen. Aufgrund ihrer Lebensweise muß den Ameisen bei Biotopuntersuchungen eine große Aussagekraft über den Zustand eines Landschaftsbereiches zugeschrieben werden. So bedeutet die vorliegende zusammenfassende Darstellung der Ameisen Mitteleuropas, in der auch wichtige Bestimmungshilfen zur Erkennung der etwa 111 Arten Deutschlands erarbeitet wurden, für alle, die sich mit dieser Insektengruppe befassen, eine große Hilfe.

Das Buch enthält, auf das Wesentlichste beschränkt, Hinweise auf den Körperbau der Formicidae und dessen Funktion sowie Abschnitte über die Individualentwicklung und Kastendifferenzierung. Es folgen Beschreibungen der Lebensräume von Ameisen und Aspekte ihrer Ernährungsstrategien unter Berücksichtigung der teilweise komplizierten Parasitismusformen einiger Arten. Der Beziehung von Ameisen zu Bläulingen wie auch zu weiteren Ameisengästen wird ein zusätzliches Kapitel gewidmet, ebenso den Feinden dieser Insekten. Im systematischen Teil erleichtert ein hervorragender Bestimmungsschlüssel mit ausgezeichneten hinweisenden Detailzeichnungen die schwierigen Determinationen der Unterfamilien, Gattungen und Arten Mitteleuropas. Sehr gute farbige Habitusbilder aller Gattungen und vieler Arten ermöglichen zusätzlich das Erkennen. Jede Art wird mit Autor und Beschreibungsjahr, mit Verbreitung und umfassenden Angaben zu den Lebensweisen abgehandelt. Leider fehlen zu den Artnamen die Synonyme und größtenteils die deutschen Namen. Verschiedene Sachregister und eine kleine Literaturliste vervollständigen dieses handliche, auch für die Feldarbeit verwendbare Buch. E. Diller

26. Hopkin, S. P.: Biology of the Springtails (Insecta: Collembola). – Oxford University Press, Oxford, New York. 1997. 330 pp., ISBN 0-19-854084-1.

Springtails are the most numerous and widespread insects in terrestrial ecosystems. They are important ecotoxicological test organisms and have been used extensively to indicate the effects of evironmental pollutants and different agricultural regimes on biodiversity in soils. This comprehensive and richly illustrated work is the only single-volume review on the biology of springtails in English language to appear in this century. The book covers classification, behaviour, physiology, evolution, ecology, and ecotoxicology. An extensive reference section with more than 2500 entries is included, together with a complete list of all known Collembola genera, a list of studies on the effects of chemicals on springtails, and references to species checklists for most countries of the world.
E. Diller

27. Nuridsany, C. & M. Pérennou: Mikrokosmos. Das Volk in den Gräsern. – Scherz Verlag, Bern, München, Wien. 1997. 159 S. ISBN 3-502-15520-8.

Die Basis zu diesem hervorragend ausgestatteten Buch, das fast ausschließlich aus wunderschönen, farbigen, großformatigen Insektenbildern besteht, war der von den Autoren gedrehte Film "Mikrokosmos". Dieser Film erhielt 1996 beim Filmfestival von Cannes den "Großen Preis der Technik", und beim Festival von Locarno wurde er zum Publikumsliebling erkoren. Er war als Naturmärchen konzipiert, eine pantheistische Hymne an die Schönheit der Insekten, ohne einen erklärenden Text zu der gezeigten Pracht. Auch das vorliegende Werk kommt mit einer kurzen Einführung in die Welt der Insekten und einem Kapitel: "Wie man Insekten filmt" sowie im Anhang mit kurzen Bildlegenden aus.
E. Diller

28. Pölking, F.: Nahfotografie in der Natur: Kameras, Ausrüstung, Zubehör, Motive, Bildgestaltung, Filme, Fotopraxis, Lichtführung. – Augustus Verlag, Augsburg, 1997. 96 S. ISBN 3-8043-5097-6.

Im Untertitel dieses Buches sind die Themen des Inhaltes bereits angesprochen, die in einer knappen, sachlichen Sprache ausführlich und ohne Schnörkel behandelt werden. Das Werk erklärt alles, was man wissen muß, um so exzellente Bilder fotografieren zu können, wie sie beispielhaft in den sehr vielen Farbabbildungen durch den Autor vorgegeben sind. Vermutlich wollte der Autor auch erreichen, daß man bei bestimmten aufnahmetechnischen Fragestellungen nachschlagen kann, um ein hervorragendes fotografisches Ergebnis zu bekommen. Das Buch ist sehr zu empfehlen, die enthaltenen Informationen sparen mit Sicherheit viel Lehrgeld.
E. Diller

29. Franck, D.: Verhaltensbiologie. – Thieme Verlag Stuttgart, 1997. 225 S. ISBN 3-13-567603-X.

Die mittlerweile dritte Auflage von Dierk Franckes Verhaltensbiologie wurde völlig umgestaltet. Lediglich der einführende Charakter und die Gliederung in drei Hauptkapitel blieb erhalten. Sie heißen nun Verhaltensphysiologie, Verhaltensontogenie und Verhaltensökologie. Die seit der zweiten Auflage beigefügten Forschungsbeispiele wurden komplett durch 15 neue, aktuelle Beiträge ersetzt. Die nicht mehr zeitgemäßen Vorstellungen zur Steuerung der Handlungsbereitschaft wurden ersatzlos gestrichen. Bedingt durch die enormen Fortschritte in der Verhaltensökologie mußte Franck das dritte Kapitel völlig neu schreiben. Das Lehrbuch überzeugt durch seine klare verständliche Sprache. Die aktuellen Forschungsbeispiele geben dem interessierten Wissenschaftler Anregung und Hilfe bei Fragestellung und Methodik. Der relativ hohe Preis erklärt sich durch den kostenintensiven zweifarbigen Druck.
M. Schmelzle

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INHALT - CONTENTS

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The African and Madagascan freshwater crabs in the Zoologische Staatssammlung, Munich

(Crustacea, Decapoda, Brachyura, Potamoidea)

Neil Cumberlidge

Cumberlidge, N. (1998): The African and Madagascan freshwater crabs in the Zoologische Staatssammlung, Munich (Crustacea, Decapoda, Brachyura, Potamoidea). – Spixiana **21/3:** 193-214

The collection of African and Madagascan freshwater crabs in the Zoologische Staatssammlung, Munich has been reevaluated. The collection includes twenty eight species of *Potamonautes*, seven species of *Sudanonautes*, two species each of *Platythelphusa, Hydrothelphusa, Deckenia, Potamonemus*, and *Louisea*, and one species each of *Liberonautes, Gecarcinautes and Potamon*. The collection includes the holotype of *Louisea edeaensis*, and paratypes of *L. balssi, Sudanonautes monodi* and *Potamonautes gerdalensis*.

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Introduction

The collection of freshwater crabs from Africa in the Zoologische Staatssammlung, Munich (ZSM) owes a great deal to the efforts of Prof. Heinrich Balss (1886-1957) who, in addition to his work on the Decapoda in general, authored a number of articles on the taxonomy of African freshwater crabs. These works included material held in the ZSM from East and West Africa (1914a), West Africa (Balss 1929a), East Africa and Madagascar (Balss 1929b, 1934), and Central and southern Africa (Balss 1914b, 1922,1936). The present work represents an attempt to identify and catalogue the African and Madagascan freshwater crab material in the ZSM according to the most recent taxonomic conventions for the group.

Data on the material examined are listed in the following order: region of Africa, country, original collection locality and modern equivalent, number of males and /or females, state of maturity, date, name of collector and / or donator, and ZSM inventory number. The following abbreviations are used: MLü = Museum Lübeck, Germany; MNHN = Muséum National d'Histoire Naturelle, Paris, France; MRAC = Museum Royal d'Afrique Centrale, Tervuren, Belgium; NHML = Natural History Museum, London; ZMB = Museum für Naturkunde der Humboldt-Universität, Berlin, Germany; cw = carapace width at widest point; cl = carapace length measured along median line, the distance from the midpoint of the frontal margin to the midpoint of the posterior margin; ch = carapace height, maximum height of cephalothorax; fw = front width, width of front measured along it's anterior margin; coll. = collected by; don. = donated by; ad. = adult; subad. = subadult; juv. = juvenile. All measurements are given in mm.

Taxonomy

The majority of the specimens from East African and Madagascar in the present work were initially identified by Dr. Balss. This determination has since been updated to conform to the classification of Bott (1955) who completely revised the taxonomy of the entire continental African freshwater crab fauna. Bott's (1955) classification departed from that of Balss (1914a,b, 1929a,b, 1936) in a number of ways and, until recently, was widely accepted. However, Bott's (1955) taxonomy is now out of date and contains a number of errors. The West African freshwater crab fauna was recently revised by Cumberlidge (1998), but the taxonomy of the East African freshwater crabs fauna (especially *Potamonautes*) is still questionable, despite the contributions by Williams (1991) and Ng et al. (1995). Bott also published the most recent classification of the entire Madagascan freshwater crab fauna (Bott 1965), which was recently modified in part by Ng & Takeda (1994). However, a great deal of uncertainty still surrounds the taxonomy of the Madagascan freshwater crabs, and a comprehensive revision is badly needed.

The taxonomy followed in the present work for the freshwater crabs from continental Africa is that of Cumberlidge (1987, 1991, 1993a,b,c, 1994a,b, 1995a,b,c,d, 1998), Cumberlidge & Sachs (1989a,b), and Cumberlidge & Clark (1992). These works include a substantial number of changes to the taxonomy suggested by Bott (1955, 1959, 1964, 1970a,b). Notably, all of Bott's subgeneric categories, and most of his subspecific categories are not used here, and many of his synonymies are not accepted.

The collection of the ZSM includes one species of *Potamon* Savigny, 1816 (Potamidae) from North Africa and two species of *Deckenia* Hilgendorf, 1869 (Deckeniidae) from East Africa. The majority of specimens in the collection of the ZSM come from continental Africa and belong to the Potamonautidae. They are referred here to six genera: *Potamonautes* MacLeay, 1838, *Platythelphusa* A. Milne-Edwards, 1887, *Sudanonautes* Bott, 1955, *Liberonautes* Bott, 1955, *Potamonemus* Cumberlidge & Clark, 1992 and *Louisea* Cumberlidge, 1994a. In addition, the collection of the ZSM includes four species of freshwater crabs from Madagascar which are included here in two genera, *Hydrothelphusa* A. Milne-Edwards, 1872 and *Gecarcinautes* Bott, 1960. However, the taxonomy of the freshwater crabs from Madagascar is far from stable.

The identification of a number of other specimens of freshwater crabs from Madagascar in the ZSM collection present difficulties in their generic assignment. A definitive assignment of these specimens awaits a complete taxonomic revision of the Madagascan freshwater crabs and so these specimens are listed here under their original name. The use of the genus *Potamon* does not imply that they belong to the genus *Potamon* sensu Bott, 1970b (they most definitely do not), it simply reflects uncertainty as to their correct assignment. According to the literature, there are at present four genera of freshwater crabs found in Madagascar: *Hydrothelphusa, Gecarcinautes, Madagapotamon* and *Skelosophusa*. Ng and Takeda (1994) assigned two of these genera *(Madagapotamon* and *Skelosophusa)* to the Potamonautidae, and Bott (1965) assigned *Hydrothelphusa* to the Hydrothelphusinae and *Gecarcinautes* to the Gecarcinucidae.

Deckeniidae Ortmann, 1897

Deckenia Hilgendorf, 1869

Deckenia Hilgendorf, 1869: 2; 1898: 23; Rathbun 1906: 69; 1921: 434; Balss 1929b: 353; Chace 1942: 225; Bott 1955: 219.

Deckenia imitatrix Hilgendorf, 1869

Deckenia imitatrix Hilgendorf, 1869: 24, fig. 8; Ortmann 1902: 306; Bott 1955: 219, fig. 6, pl. 1, figs 1a-d; Pretzmann 1977: figs 17-20; Ng et al. 1995: 583, tabs 1, 2.

Material. East Africa, Taro (Taro?, in Kenya there is a place called Taru, northwest of Mombasa), probably Kenya (formerly British East Africa), 1♂ ad. cw 40.9, 1 juv. 26.6, O. Neumann coll. (ZSM 1235/1).

Comments. This East African family comprises one genus with two species and is found in Tanzania (Zanzibar), Kenya, and Somalia. Both species are represented in the collection of the ZSM. This genus was recently reviewed by Ng et al. (1995) who provided detailed comparisons between the two species. Bott (1955) provided photographs of the whole animal and a sketch of the first gonopod; he pointed out that the type locality is Zanzibar (and not Kudiano, East Africa, as was cited by Chace, 1942).

Pretzmann (1977) provided photographs of the carapace and gonopod 1 of a specimen of *D. imitatrix* from Somalia.

Deckenia mitis Hilgendorf, 1898

Deckenia mitis Hilgendorf, 1898: 24, fig. 8; Ortmann 1902: 306; Bott 1955: 221, fig. 5, pl. 1 figs 2a-d; Ng et al. 1995: 583-585, figs 1b, 2, 3, tabs 1,2.

Material. East Africa, Tanzania (formerly German East Africa), Ruwana river, which flows into Lake Victoria at Speke Gulf), 1♂ ad. cw 31.3, 1♀ ad. 30.2 (hatchlings), several soft-shelled small crabs (cw 11), 1911, Kattwinkel coll. (ZSM 1236/1); Kilimatinde, northwest of Dodoma, "Turuexpedition", 1♂ ad. cw 48.3, Claiss? coll. (ZSM 1236/2, don. ZMB 13505); Usa river, east of Arusha, 1♂ ad. cw 33, freshwater, 25 °C, 11.1959 (ZSM 1236/3).

Comments. Bott (1955) provided photographs of the whole animal and a sketch of the first gonopod; he also listed a number of differences between *D. mitis* and *D. imitatrix*. The differences between the two species were tabulated by Ng et al. (1995), who added new characters and provided illustrations of the gonopods, the mandibles and the mouthparts. The chelipeds of the adult female in the present study were observed to be small and equal sized, and are not greatly heterochelous (with one much larger than the other) as is the case for adult males.

The type locality (Wembere Steppe (n. Tabora), East Africa) is probably in Tanzania. In the region of Tabora the Ruwana river flows into Lake Victoria at Speke Gulf, and this is where some of the ZSM material was collected. It is interesting to note that *Potamonautes gerdalensis* Bott, 1955 was also collected in this same region. The new localities for *D. mitis* are all in Tanzania. Williams, Hynes & Kershaw (1964) provided some observations on the habitat of *D. mitis* caught in an arid area of northern Tanzania close to Mount Meru. Specimens of *D. mitis* were collected in stagnant surface waters (which were also quite warm), and this species was never found in the cooler streams flowing down mountain slopes. *Deckenia mitis* was collected together with *Potamonautes obesus* which apparently shares the same habitat. *Deckenia mitis* and *P, obesus* were rarely observed in the water by these workers and both species burrowed deeply into the soil at the water's edge and often caused extensive damage to drainage ditches.

Potamidae Ortmann, 1896

This family is represented in continental Africa by a single species, *Potamon fluviatilis algeriense* (Bott, 1967). This taxon occurs only in the northwest region of Africa in the Mediterranean countries of Algeria, Tunisia, and Morocco. The ZSM collection includes specimens from the first of these countries.

Potamon Savigny, 1816

Potamon Savigny, 1816: 251.

Potamon fluviatilis algeriense (Bott, 1967)

Potamon fluviatilis algeriense Bott, 1967: 130, pl. 5, figs 40-43; Bott 1970a: 339; 1970b: 136, pl. 37, fig. 2, pl. 42, fig. 2.

Material. North Africa, Algeria, Algiers = Alger, El Kantara, ca. 30 km north of Biskra, southeast of Lake Chott el Hodna, 1♂ ad. cw 30.8, 2 juvs. cws 20, 18, G. F. de Witte coll. (ZSM 1522/1 ex 1154/5, alte ZSM Nr. 1935, don. MRAC).

Comments. This genus was most recently reviewed by Bott (1970b), whose taxonomy is followed here. The synonymy for this species is provided by Bott (1970b). The mandibular palp of these specimens consists of three distinct segments which (together with other characters) warrants their inclusion in the Potamidae rather than in the Potamonautidae. With the exception of *Platythelphusa* from Lake Tanganyika, all other freshwater crabs from continental Africa and from Madagascar have a mandibular palp with two distinct segments.

Potamonautidae Bott, 1970a

Erimetopus A Milne-Edwards, 1886

Erimetopus Rathbun, 1894: 26; *Potamonautes (Erimetopus)*, Bott 1955: 223.

Erimetopus brazzae Rathbun, 1905

Thelphusa brazzae A. Milne-Edwards, 1886: 148; Ortmann 1897: 300; *Parathelphusa brazzae*, A. Milne-Edwards 1887: 142, pl. 8, fig. 6; de Man 1898: 438; *Erimetopus brazzae*, Rathbun 1905: 270, fig. 73, pl. 21, fig. 8; Lenz 1912: 9; Colosi 1920: 27; Rathbun 1921: 433-434, pl. 33, fig. 15; Balss 1936:195; Chace 1942: 225; Capart 1954: 846, fig. 43; *Potamonautes* (*Erimetopus*) *brazzae brazzae*, Bott 1955: 224-225, figs 7a-b, pl. III, figs 1a-c.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Kinshasa (formerly Léopoldville), 1933, 1♀ ad. cw 31.5 (ovig.), A. Tinant coll. (ZSM 1528/1, ex 1184/1, don. MRAC).

Comments. Bott (1955) considered *E. brazzae* to belong to the genus *Potamonautes* and recognised the subgenus (*Erimetopus*) to accommodate this species. Bott (1955) used characters of the first and second gonopod to assign taxa to genus, subgenus and species categories. Since *E. brazzae* is known only from female specimens the structure of gonopods 1 and 2 of this species are still unknown. For this, and other, reasons Bott's (1955) opinion is not accepted and *E. brazzae* is recognised here as a distinct genus. The structure of the mandibular palp of *E. brazzae* (two-segmented with a simple terminal segment) argues for it's inclusion in the Potamonautidae.

Potamonautes MacLeay, 1838

Twenty eight species of *Potamonautes* are represented in the collection of the ZSM. The species are arranged alphabetically. None of the subgenera of *Potamonautes* erected by Bott (1955) are recognised here.

Potamonautes aloysiisabaudiae (Nobili, 1906)

Potamon (*Potamonautes*) *Aloysii-Sabaudiae* Nobili, 1906:1; *Potamon* (*Potamonautes*) *johnstoni* Calman, 1909: 51-56, figs 9, 10, 12 [non *Johnstoni* Miers]; *Potamonautes* (*Lobopotamonautes*) *aloysiisabaudiae*, Bott 1955: 281-283, pl. 18, figs 2a, 3a, pl. 20, figs 2a-d, figs 1, 2, figs 48, 50, 87, 88, 89.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Avakubi, on the Ituri river, northeast of Kisangani (formerly Stanleyville), 1♂ subad. cw 22.6, 1♀ subad. cw 22.4, 11.09.1912, Christy coll. (ZSM 1175/2); Bondo Mabé, near Arebi, south of Watsa, 2♂♂ cws 41.7, 27.2, 07.1925, H. Schouteden coll. (ZSM 1175/3); Mauda, south of Doruma, upper Uele river (formerly Uelle river), 1♂ ad. cw 41.5, 2♀♀ subads. cws 38.4, 29.6, 03.1925, H. Schouteden coll. (ZSM 1175/4); upper Uele river (formerly Uelle river), 1♂ subad. cw 35.2, 2♀♀ subads. cws 39.8, 37.4, 08.1924, Rossi coll. (ZSM 1175/5).

Comments. Bott (1955) synonymized this species with a number of published taxa. However, comparisons between the type material of some (but not all) of Bott's (1955) synonymized taxa raise doubts about the validity of Bott's (1955) conclusions, which are not accepted here. The specimens in the ZSM correspond well with *Potamon* (*Potamonautes*) *johnstoni* from Ruwenzori which was described and illustrated by Calman (1909). The specimen of *P. aloysiisabaudiae* from Ruwenzori used by Nobili (1906) to describe the species is apparently lost, and Nobili's (1906) original description was brief; Calman's (1909) specimens from Ruwenzori are therefore used here as examples of the species. *Potamonautes aloysiisabaudiae* can be recognised by the following characters: the suborbital margins and the anterolateral margins of the carapace are completely smooth, the epibranchial tooth is low or absent, the exorbital angle is low, the vertical sulcus on the sidewalls in the subhepatic region is faint, the 4th episternal suture is missing, there is no vertical sulcus on the ischium of the third maxilliped, and there is a small raised longitudinal crest running along the centre of the terminal segment of gonopod 1.

Potamonautes anchetiae (Brito-Capello, 1871)

Thelphusa Anchietae Brito-Capello, 1871: 132, pl. 2, fig. 11; *Potamonautes* (*Isopotamonautes*) *anchetiae*, Bott 1955: 247-249, figs 24, 76, 77, pl. IX, figs 1a-d.

Material. Central Africa, Angola, Benguela, Entre Rios?, 1♀ subad. cw 34.6, 06.1954, Schönfeld coll. (ZSM 1535/1 ex 1176/4).

Comments. Bott (1955) assigned specimens of *P. anchetiae* to the subgenus *Isopotamonautes* Bott, 1955, but this subgenus is not recognised here. Balss (1929a) identified as "*P. anchetiae*" a number of specimens from Cameroon that are now known to belong to *Potamonemus mambilorum* (Cumberlidge & Clark, 1992).

Potamonautes ballayi (A. Milne-Edwards, 1886)

Thelphusa Ballayi A. Milne-Edwards, 1886: 149; *Potamon ballayi*, Chace 1942: 206; Capart 1954: 827, fig. 3; *Potamonautes* (*Longipotamonautes*) *ballayi ballayi*, Bott 1955: 244-245, figs. 23, 73, pl. VII, fig. 2a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Djamba Lower Uele river (formerly Uelle river), 3♂♂ ads. cws 28.3, 25.9, 24.8, 2♀♀ ads. cws 23.8, 25.2, 1♀ subad. cw 19.7, 20.12.1925, H. Schouteden coll. (ZSM 1178/1); Kinshasa (formerly Léopoldville), 1933, 1♂ ad. cw 19.3, 1♀ ad. cw 19.2, A. Tinant coll. (ZSM 1178/2, don. MRAC); Bambesa, Uele river (formerly Uelle river), 3♂♂ ads. cws 25.2, 20.1, 21.4, 3♀♀ ads. cws 22.8, 22.1, 23.1, 14.10.1933, H. Bredo coll. (ZSM 1178/3, don. MRAC).

Comments. Bott (1955) assigned specimens of *P. ballayi* to the subgenus *Longipotamonautes* Bott, 1955, but this subgenus is not recognised here. *Potamonautes ballayi* can be recognised by a distinct and sharp epibranchial tooth and the lack of other teeth on the anterolateral margin. In addition, the sidewalls are divided into two parts by the epimeral suture, and the major cheliped of adult males is enlarged with a widely arched dactylus and a propodus that is longer than the carapace width.

Potamonautes bayonianus (Brito-Capello, 1864)

Thelphusa Bayoniana Brito-Capello, 1864: 2, pl. 3, fig. 3; *Potamon* (*Potamonautes*) *bayonianus*, Barnard 1950: 191-192; *Potamonautes* (*Potamonautes*) *bayonianus bayonianus*, Bott 1955: 251-252, pl. X, figs 2a-d, fig. 28.

Material. Southern Africa, 1♂ cw 28.5, 2 juvs. 25.8, 15.9, allegedly Tanzania (formerly German East Africa), Amani, more likely Zimbabwe (formerly Southern Rhodesia), Dingler coll. (ZSM 1179/1, Trockenmaterial, Nr. 1920/501); Zimbabwe (formerly Southern Rhodesia), 3♂♂ cws 27 0, 24.2, 18.6, Dingler coll. (ZSM 1179/2 ex 1180/1); Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), lower course of the Congo river, formerly Matadi-District, Ango-Ango? (probably Langa-Langa, near Kinshasa, on the lower Congo river), 1♀ ad. cw 47, 05.1923, Maur. Bequaert coll. (ZSM 1176/3 ex 1176/2).

Comments. *Potamonautes bayonianus* can be recognised by a postfrontal crest that completely crosses the carapace and by the fields of granules on the sidewalls, which are divided into four parts. This is a large species distributed over a wide area of southern Africa from the lower Congo river to Zimbabwe, Namibia, and South Africa.

Potamonautes berardi (Audouin, 1826)

Telphusa Berardi Audouin, 1826: 82, pl. 2, fig. 6; *Potamon berardi*, Capart 1954: 827, figs 4, 31; *Potamonautes* (*Rotundopotamonautes*) *berardi berardi*, Bott 1955: 288-289, figs 53a-b, pl. 23, figs 1a-d; Monod, 1980: 382-383, pl. V, fig. 28.

Material. Fajum, Massaré (probably Egypt, Faiyum Province, 1♀ cw 31.2 (ovig.) (ZSM 1181/1); East Africa, Rwanda (formerly the Belgian Congo, and before that German East Africa) Nyanza (formerly Niansa) southeast of Lake Kivu, 1♂ ad. cw 24.3, Herzog Adolf F. von Mecklenburg coll. (ZSM 1181/2, don. MLü 1112a/245); East Africa, Ruamzoni? (probably the Ruwenzori Mountains in Uganda), 1♂, 1♀, Herzog Adolf F. von Mecklenburg coll. (ZSM 1181/3, don. MLü 1123/245); Northeast Africa, Ethiopia (formerly Abysinnia), Mount Gara Mulata

(= Mount Gara Muleta), southwest of Harar (=Harer), 2700m, 2♀♀ cws 23, 23.2 (both ovig.), Carlo Freiherr von Erlanger, 03.1900 (ZSM 1181/4); Gardulla stream, Gardulla near Gidole, Gamu-(=Gemu)-Gofa-District, south of Lake Chamo, 2300m, 2♀♀ ads. cws 26, 22 (ovig.), 1♀ subad. cw 18.8, 05.01.1901, O. Neumann, coll. (ZSM 1181/5); stream near Gorgias?, Georgis? (Sciré), stream near Hauasch (now Awash river), running water, 2300-2400m, 1♀ ad. cw 29.3, 1♀ subad. cw 21.7, several juvs., 30.07.1900, Carlo Freiherr von Erlanger coll. (ZSM 1181/6 ex 1186/1); 1♀ ad. cw 35.6, 1♀ subad. cw 30.9, 1♂ subad. cw 29.2, 3 juvs. (ZSM 1186/7); Sheik-Mohamed-Lager, stream at Wabbi? (probably Web), running water, northwest of Ginir, Arussi-District, 1900-2100m altitude (ca. 7°19'N, 40°30'E), 1♀ ad. cw 37.0 (ovig.), 1♀ ad. cw 39.1, 1♂ subad. cw 29.8 (gonopods in vial), 5 juvs., 11.07.1900, Carlo Freiherr von Erlanger coll. (ZSM 1181/8 ex 1186/3); Harar (=Harer), Ererfluss-Quelle, Abessinien, 1♀ ad. cw 33.5, 1♀ subad. cw 26.6, 07.1900?, Carlo Freiherr von Erlanger and O. Neumann coll. (ZSM 1181/9 ex 1186/4).

Comments. The complete synonymy is provided by Bott (1955). *Potamonautes berardi* can be recognised by a deep and complete suture between sternites 2 and 3, by a faint almost absent postfrontal crest, by the lack of an epibranchial tooth, and by the lack of a vertical sulcus on the ischium of the third maxilliped. This is a small species found in the river Nile (in Egypt, Ethiopia, Uganda, and Rwanda) which reaches maturity at about cw 23.

Potamonautes bipartitus (Hilgendorf, 1898).

Thelphusa bipartita Hilgendorf, 1898: 15-16; *Potamonautes* (*Arcopotamonautes*) *bipartitus*, Bott 1955: 273-274, figs 42, 43, 85, pl. 18, figs 1a-d, 4a-b.

Material. East Africa, Tanzania (formerly German East Africa), 1♀ subad. cw 21.8, Stuhlmann coll. (ZSM 1183/1).

Comments. This species is known only from Tanzania.

Potamonautes bottegoi (de Man, 1898)

Potamon (*Potamonautes*) *Bottegoi* de Man, 1898: 262-270, pl. 3; *Potamon* (*Potamonautes*) *bottegoi*, Barnard 1950: 192-193, figs 34f-g; *Potamonautes* (*Obesopotamonautes*) *obesus obesus*, Bott 1955: 257-259, figs 19, 80, pl. XII, figs 2a-d.

Material. East Africa, Mozambique, Quelimane, Zambezia District, 1♂ subad. cw 34.2, Peters coll. (ZSM 1517/1 ex 1200/1, don. ZMB Nr. 1911/4382); Tanzania, Indian Ocean, Pemba Island, 1♀ subad. cw 29.5, 1♂ juv. cw 19.3, Lenz coll. (ZSM 1200/2 , don. MLü).

Comments. *Potamonautes bottegoi* is found in Tanzania (Pemba Island), Somalia, and Mozambique. *Potamonautes bottegoi* is close to *P. obesus*. Balss (1929a) regarded *P. bottegoi* as a synonym of *P. obesus*, and Bott (1955) treated *P. bottegoi* as a junior synonym of *Potamonautes* (*Rotundopotamonautes*) *obesus obesus*. The two taxa share the following characters: the dorsal surface of the carapace is smooth and highly vaulted, and the major cheliped of adult males is longer than the carapace width. However, *P. bottegoi* is treated here as a valid species on the basis of the following differences with *P. obesus*: the sidewalls of *P. bottegoi* are divided into four parts by two additional granulated raised lines in the subhepatic and pterygostomial regions; and the sidewalls are heavily granulated, not smooth as in *P. obesus*. Moreover, episternal sutures 4-7 (between sternites 4-7 and episternites 4-7) are all deep and distinct (these same sulci are absent in *P. obesus*), and the first gonopods of the two taxa (shown in Pretzmann 1977) are by no means identical.

Potamonautes dybowskii (Rathbun, 1905)

Potamon (Potamonautes) dybowskii Rathbun, 1905: 177-178, fig. 44, pl. 15, fig. 3; *Potamonautes dybowskii*, Chace 1942: 187; Capart 1954: 832, figs 14, 25; *Potamonautes* (*Orthopotamonautes*) *dybowskii*, Bott 1955: 276-278, figs 45a,b, pl. 19, figs 2a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Medje north of the Ituri river, southwest of Paulis (=Isiro), 1♂ ad. cw 55.1, 09.1926, H. Schouteden coll. (ZSM 1536/1 ex 1185/1, alte ZSM Nr. 1935, don. MRAC); Buta on the Uele river (formerly the Uelle river), 1♀ ad. cw 47.2

(ovig.), 30.01.1925, H. Schouteden coll. (ZSM 1536/2 ex 1185/3, alte ZSM Nr. 1935, don. MRAC); Aruwimi river, 1♀ subad. cw 47.5, Schubotz coll. (ZSM 1536/3 ex 1185/4, alte ZSM Nr. 1911/4381, exchange: ZMB).

Comments. This species is found in Central Africa in the upper reaches of the Zaire (Congo) river and in the Uele river.

Potamonautes ecorssei (Marchand, 1902)

Potamon (Potamonautes) Ecorssei Marchand, 1902: 334-342, pl. 13, figs 2-6; *Potamon nigrensis* Capart, 1954: 833, figs 8, 20; *Potamonautes* (*Platypotamonautes*) *ecorssei*, Bott 1955: 236-237, figs 13, 67, pl. 6, figs 2a-d; 1959: 1001-1002, figs 9a-c; Monod 1969: 78-79, figs 4-7; 1977: 1212-1213, figs 71-82, 86-92; 1980: 382-383, pl. 6, fig. 32.

Material. West Africa, Togo, near the border with Ghana, Ege river, tributary of the Todje (= Todji) river, near Ho (Ghana), 1♀ juv. cw 15, Schröder coll. (ZSM 1187/1).- Cameroon (=Togo?), Moba, 1♂ cw 30, Thierry coll. (ZSM 1187/2, don. ZMB).

Comments. The complete synonymy is provided by Bott (1955). *Potamonautes ecorssei* is found only in the rivers of West Africa, notably the Niger and the Volta, and in the rivers of Togo.

Potamonautes emini (Hilgendorf, 1892)

Thelphusa emini Hilgendorf, 1892: 11; *Potamon emini*, Chace 1942: 193; Capart 1954: 832, figs 19, 32; *Potamonautes* (*Rotundopotamonautes*) *emini emini*, Bott 1955: 290-291, pl. 24, figs 1a-d, fig. 54.

Material. East Africa, Uganda (formerly British East Africa) Ruwenzori Mountains, between Lake Edward and Lake Albert, 1800m, 1♂ cw 17.1 (ovig.), 1♀ cw 13.3 (ZSM 1188/2). Rwanda (formerly the Belgian Congo, and before that German East Africa), Ruhengeri, northeast of Lake Kivu (formerly Lake Kiwu), 1♀ ad. cw 15.7 (ovig.), 1♀ juv. cw 12.2, 1933, F. Colback coll. (ZSM 1188/1); Lake Kivu (formerly Lake Kiwu), 2♂♂ cws 16.3, 12.9 (ZSM 1188/3); Lake Kivu (formerly Lake Kiwu), 2♀♀ ad. cws 22.4, 16.9 (ovig.) (ZSM 1188/4); Lake Muhazi (formerly Lake Mohasi), northeast of Kigali, 1♂ ad. cw 24.9, Herzog Adolf F. von Mecklenburg coll. (ZSM 1188/5, don. MLü 1116/245); east of Ruhengeri, Lake Luhondo, 9 m ads., 9♀♀ ads., 01-02.02.1934, F. Colback coll. (ZSM 1188/6).

Comments. The lectotype of *Telphusa emini* is a male (ZMB #8406) from the bay of Bukoba, on the west coast of Lake Victoria in western Tanzania, East Africa. Bott (1955) synonymized *P. emini* with *Potamon mutandensis* Chace, 1953 from lake Mutanda, Uganda. However, comparison of the type of *P. mutandensis* with illustrations of the carapace and gonopod 1 of *P. emini* in Bott (1955) and Capart (1954) raises doubts about the validity of Bott's (1955) synonymy, which is not accepted here. *Potamonautes emini* can be recognised by the lack of sternal sulcus 2 between sternites 2 and 3, by a weak, faint postfrontal crest, by a faint vertical sulcus on the ischium of the third maxilliped, and by the lack of an epibranchial tooth on the anterolateral margin of the carapace. This species reaches maturity between cw 30 and cw 45.

Potamonautes gerdalensis Bott, 1955

Potamonautes (*Gerdalopotamonautes*) *gerdalensis* Bott, 1955: 261-262, figs 34, 82, pl. 13, figs 3a-d.

Material. East Africa, Tanzania (formerly German East Africa), Gerdalo (Girdalo), Ruwana-Steppe (probably in the region of Tabora) (there is a Ruwana river, that flows into Lake Victoria at the Speke Gulf), Holotype, 1♂ ad. cw 34, Paratypes, 1♀ ad. cw 29.3, 1 juv. cw 22.1, 27.01.1911, Kattwinkel coll. (ZSM 1189/1).

Comments. This species was identified by Balss (1914a) as *Potamon* (*Potamonautes*) *reichardi* Hilgendorf (1898). Bott (1955) considered that this material belonged to a new taxon and established a new subgenus to accommodate it, identifying these specimens as *Potamonautes* (*Gerdalopotamonautes*) *gerdalensis* Bott, 1955. This species is known only from the type material.

Potamonautes ignestii (Parisi, 1923)

Potamon (Geotelphusa ignestii Parisi, 1923: 332-334, pl. 8, fig. 1; *Potamonautes* (*Rotundopotamonautes*) *berardi ignestii,* Bott 1955: 289-290, pl. 23, figs 2a-d.

Material. Northeast Africa, Ethiopia (formerly Abysinia), Gondar (=Gonder), north of Lake Tana, Caba river, 1♂ ad. cw 39.3, 2♀♀ subads. cws 33.1, 30.8 (ZSM 1182/1).

Comments. *Potamonautes ignestii* is a medium sized species, adult at around cw 35, and this, together with the form of gonopod 1 help to distinguish it from similar, but smaller, species such as *P. berardi, P. emini* and *P. neumanni.*

Potamonautes johnstoni (Miers, 1885)

Thelphusa depressa Krauss, var. *Johnstoni* Miers, 1885: 237-239; *Potamon* (*Potamonautes*) *johnstoni,* Balss 1929a: 343-344; *Potamon johnstoni,* Chace 1942: 187; Capart 1954: 832, figs 14, 25; *Potamonautes* (*Lirrangopotamonautes*) *johnstoni johnstoni,* Bott 1955: 265-266, figs 36a,b, pl. 15, figs 2a-d.

Material. East Africa, Kenya (formerly British East Africa), Kibwezi, northeast of Kilimanjaro, 4000m, 1♀ ad. cw 53.4, 1♂, 2♀♀ subad. cw 29.8 (ZSM 1192/6). East Africa, Tanzania (formerly German East Africa), Lindi, about180 km up country, 1♀ ad. cw 44.23 (ovig.), Ertl coll. (ZSM 1192/3); Kahe, Kahe rivulet, near Moshi, south of Kilimanjaro, 1♀ ad. cw 56.6, 1♂, 2♀♀ subad. cw 29.8, O. Neumann coll. (ZSM 1192/7, don. ZMB Nr. 11374); 1♀ ad. cw 50.5, von Reitzenstein coll. (ZSM 1192/5); Usa river, Usa, east of Arusha (freshwater), 3♂♂ subad. cws 34.4, 30.7, 25.1, 06.11.1959 (ZSM 1192/9); Kibosho (formerly Kiboscho) near Moshi, south of Mount Kilimanjaro, 1♂ ad. cw 58.4, 1♂ subad. cw 48.6, 2♀♀ ad. cws 59.7, 51.3, 2♂♂ subad. cws 36.6, 42.2, 1♂ juv. cw 31, 01.1895, O. Neumann coll. (ZSM 1192/12, don. ZMB); (formerly Matumbi-caves, Nduci (Nduli?)-caves, 800m, 1♀ subad. cw 40.7, 16.03.1905. Methner coll. (ZSM 1192/13, ex 1191/1, don. ZMB); Amani, between Korogwe and Tanga, 1♀ ad. cw 74.5 (ovig. egg diameter 1.93), 1♂, 2♀♀ juvs. cws 29.5, 27.1, 23, Vosseler coll. (ZSM 1192/14 ex 1191/2); Marangu, near Moshi, southeast of Mount Kilimanjaro, 1♀ ad. cw 52.7 (ovig.), 1♂ ad. cw 50.7, 04?.10.1952, N. Pavlitzki coll. (ZSM 1192/15 ex 1191/3). East Africa, Zanzibar Island?, Taita? (in Kenya (formerly British East Africa) there is an area and a mountain range named Taita, near Voi), 1♂ subad. cw 33.2, Hildebrandt (ZSM 1192/4, don. ZMB 1911/4380). East Africa, Malawi (formerly Nyasaland, British Central Africa), Blantyre, 1♀ ad. cw 56.1, 1908 (ZSM 1192/8, don. MLü Nr. 895/245). Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Avakubi, on the Ituri river, northeast of Kisangani (formerly Stanleyville), 1♂ ad. cw 49.3, Herzog Adolf F. von Mecklenburg coll. (ZSM 1192/10 don. MLü Nr. 1127/245).

Comments. Most of the above localities are in Tanzania, and many are in the region around Mount Kilimanjaro. Other localities (Zanzibar, Malawi and Zaire) indicate that this species occupies a wide area of Central Africa.

Bott (1955) synonymized this species with seven published taxa. However, examination of the type material of some (but not all) of the synonymized taxa here raises doubts about the validity of Bott's (1955) synonymy which is not accepted. The specimens in the ZSM correspond well to Miers' (1885) male type specimen of *Thelphusa depressa* var. *johnstoni* from Kilimanjaro (Tanzania) held in the NHML. The specimens in the ZSM from Tanzania and Zaire are not similar to the male type of *Potamon* (*Potamonautes*) *johnstoni* from Ruwenzori, Uganda (NHML 1906.6.11.6-7). *Potamonautes johnstoni* can be recognised by the following characters: the suborbital margins and the anterolateral margins of the carapace have small low teeth, the epibranchial tooth is small but distinct, the exorbital angle tooth is pointed, the vertical sulcus on the sidewalls in the subhepatic region is distinct and granular, episternal sulci 4-7 are all clearly marked, there is a distinct vertical sulcus on the ischium of the third maxilliped, and there is no raised longitudinal crest running along the centre of the terminal segment of gonopod 1.

Potamonautes langi (Rathbun, 1921)

Potamon (Potamonautes) langi Rathbun, 1921: 430-433, pl. 32, fig. 14; *Potamonautes* (*Obesopotamonautes*) *langi,* Bott 1955: 256-257, figs 17,18, 79a,b, pl. 12, figs 1a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Nyonga? (probably Katanga District, Lake Upemba, east of Kamina), 1♀ ad. cw 43.1, 1♂ subad. cw 37, 01-07.05.1925, G. F. de Witte coll. (ZSM 1193/1, alte ZSM Nr. 1935, don. MRAC).

Comments. This species inhabits the rivers of the Congo river basin and is distinguished by a distinct anterolateral margin of carapace which has several long and pointed teeth.

Potamonautes lirrangensis (Rathbun, 1904)

Potamon (Potamonautes) lirrangensis Rathbun, 1904: ???, pl. 14, fig. 8; 1905: 169; *Potamon lirrangensis*, Chace 1942: 188, figs 1, 2; Capart 1954: 836, fig. 28; *Potamonautes* (*Lirrangopotamonautes*) *lirrangensis*, Bott 1955: 268-270, figs 38. 39, 83, pl. 16, figs 2a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Kisangani (formerly Stanleyville), 1♂ ad. cw 51.2, 1930, Richard coll. (ZSM 1194/1, alte ZSM Nr. 1935, don. MRAC); Lukolela, near Liranga (formerly Lirranga)) on the Congo river, 1♀ subad. cw 48.8, 1♂ subad. 41.5, 1924, Ghesquère coll. (ZSM 1194/2). East Africa, Tanzania (formerly German East Africa), Lake Nyasa (formerly Lake Njassa), Tukuyu (formerly Neu-Langenburg), south of Mbeya, 1♂ ad. cw 57.3, 2♀♀ ad. cws 55.6, 53.1, 1♂ subad. cw 39.4, 1♀ subad. cw 31.5, Fülleborn coll. (ZSM 1194/3, don. MRAC 1935).

Comments. This species is known from the upper reaches of the Congo river, from Tanzania and from Lake Malawi.

Potamonautes loveni (Colosi, 1924)

Potamon (*Potamonautes*) *loveni* Colosi, 1924: 13-15, fig. 9, pl. 1 (4); *Potamon* (*Potamonautes*) *granviki* Colosi, 1924: 16-19, fig. 11, pl. 1 (5); *Potamonautes* (*Rotundopotamonautes*) *granviki*, Bott 1955: 286-288, pl. XII, figs 2a-d, figs 52, 90.

Material. East Africa, Uganda near the border with Kenya (formerly British East Africa), Mount Elgon, Bishugu? (probably Bugisu Province near Mbale), 1♂ cw 30.8, Koniecki coll. (ZSM 1519/1 ex 1190/1).

Comments. Bott (1955) synonymized this species with six published taxa. However, comparison of the ZSM specimens with the type material of some of the synonymized taxa raises doubts about the validity of all of Bott's (1955) synonymy, which is not accepted here. It is likely that *Potamon* (*Potamonautes*) *granviki* and *Potamon* (*Potamonautes*) *loveni* are synonyms. This opinion agrees with that of Williams (1991) who provides detailed arguments for the recognition of this taxon as *P. loveni*.

Potamonautes loveridgei (Rathbun, 1933)

Potamon (Potamonautes) loveridgei Rathbun, 1933: 251-253, pl. 1, pl. 2, fig. 3; *Potamon (Potamonautes) johnstoni stappersi*, Balss 1936: 182, 184, fig. 19; *Potamonautes* (*Tripotamonautes*) *loveridgei*, Bott 1955: 263, fig. 31, pl. 14, figs 1a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Kasiki, near Pepa, Marungu Mountains, west of Lake Tanganyika, 1♂ ad. cw 33, 27.06.1931, G. F. de Witte coll. (ZSM 1195/1, alte ZSM Nr. 1935, don. MRAC); formerly Mwerasi river, Lake Tanganyika (probably in the region of Beaudoinville and Moba), 2♂♂ ad. cws 32, 30.3, 10.11.1912, L. Stappers coll. (ZSM 1195/2).

Comments. This species inhabits the rivers in the Democratic Republic of the Congo (Zaire) that flow into the western shores of Lake Tanganyika, and from the rivers in Tanzania that flow into the eastern shores of Lake Tanganyika. Balss (1936) identified these specimens as *Potamon* (*Potamonautes*) *johnstoni stappersi* and illustrated the unusual and distinctive first gonopod.

Potamonautes margaritarius (A. Milne-Edwards, 1869)

Thelphusa margaritaria A. Milne-Edwards, 1869: 185, pl. 9, figs 4, 4a, 4b; *Potamon margaritarius*, Chace 1942: 216; Capart 1954: 838; *Potamonautes* (*Platypotamonautes*) *margaritarius*, Bott 1955: 229-230, 235, fig. 11, pl. 30, figs 1a-d.

Material. Atlantic Ocean, Gulf of Guinea, São Tomé Island (formerly São Thome), Connbra? 1♂ ad., 12.1883, R. Greef coll. (ZSM 1196/1).

Comments. This species is restricted to the island of São Tomé and is the only species of freshwater crab found on that island.

Potamonautes neumanni (Hilgendorf, 1898)

Thelphusa neumanni Hilgendorf, 1898: 18-19, pl. 1, fig. 1; *Potamon neumanni*, Chace 1942: 217; Capart 1954: 839, figs 30, 33; *Potamonautes* (*Platypotamonautes*) *neumanni*, Bott 1955: 238-239, pl. V, figs 2a-d, figs 14, 69.

Material. East Africa, Kenya (formerly British East Africa), formerly Ngare Longai (river?), Massailand, near Nairobi (36°E, 1.5°S), Paratype, 1♂ juv. cw 18.4 (ZSM 1198/1). East Africa, probably Kenya (formerly British East Africa), 1♂ ad. cw 33.8, 1♀ ad. cw 34, O. Neumann coll. (ZSM 1198/2 ex 1197/1).

Comments. The lectotype of *Thelphusa neumanni* is a male (ZMB #11386) from Ngare Longai, Masailand 36°E 1.5°S, East Africa. Bott (1955) synonymized this species with *Potamon jeanneli* Bouvier, 1921. However, comparison of the type of *P. jeanneli* with the lectotype of *P. neumanni* raises doubts about the validity of Bott's (1955) synonymy, which is not accepted here. *Potamonautes neumanni* can be recognised as follows. There is no visible episternal sulcus between sternite 4 and episternite 4, and the ischium of the third maxilliped lacks a vertical sulcus. The medial and lateral folds on the terminal segment of gonopod 1 are of equal size and there is a large rounded shoulder on the medial margin of the subterminal segment close to the junction between the segments. *Potamonautes neumanni* from East Africa is a small species, reaching maturity at cw 24.

Potamonautes niloticus (H. Milne Edwards, 1837)

Thelphusa nilotica A. Milne-Edwards, 1837: 12; *Potamon niloticus*, Chace 1942: 218; Capart 1954: 841, figs 16, 35; *Potamonautes* (*Acanthothelphusa*) *niloticus*, Bott 1955: 260, pl. 13, figs 1a-c, 30a-b; Pretzmann 1962: 305-306; Monod 1980: 382-383, pl. IV, fig. 22.

Material. East Africa, Tanzania (formerly German East Africa) formerly Karagata, 1♀ subad. cw 38.7, 1♂ juv. cw 326.3, Conrads coll. (ZSM 1199/1 don. ZMB). Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Katanga District, Lake Upemba, east of Kamina, Nyonga?, 2♀♀ ad. cws 43.3, 40.8, 01-07.05.1925, G. F. de Witte coll. (ZSM 1199/2).

Comments. The complete synonymy is provided by Bott (1955). This species is easily recognised by the complete postfrontal crest and by the series of sharp spines on the anterolateral margins of the carapace. *Potamonautes niloticus* is found throughout the entire length of the Nile, from Cairo to Lake Victoria and its tributaries, and in the eastern part of the Democratic Republic of the Congo (Zaire).

Potamonautes obesus (A Milne-Edwards, 1868)

Thelphusa obesa A. Milne-Edwards, 1868: 86, pl. 20, figs 1-4; *Potamon* (*Potamonautes*) *calcaratus* Gordon, 1929: 405-411, figs 1-4, 5a; Barnard 1950: 193-194, figs 34h,i, 35d; *Potamon calcaratus*, Chace 1942: 208; *Potamonautes* (*Obesopotamonautes*) *obesus calcaratus*, Bott 1955: 259-260, figs 15, 81; *Potamonautes* (*Obesopotamonautes*) *obesus obesus*, Bott 1955: 257-259, figs 19, 80, pl. 12, figs 2a-d.

Material. East Africa, Tanzania (formerly German East Africa), stream near Saggo-Nganga? Nyanga?, Njanga?, 1♀ ad. cw 36.8 (ovig.), 1♀ subad. cw 33.1, Fülleborn coll. (ZSM 1518/1 ex 1200/3); East Africa, 1♀ ad. cw 35.5, 1♀ subad. cw 25.8 (ZSM 1518/2 ex 1200/4, don. MLü 1113/245); Tendaguru, water hole, 1♀ ad. cw 52.2, Reck coll. (ZSM 1518/4 ex 1200/6); East Africa, Kilwa (probably Tanzania, formerly German East Africa), Kilwa (Kivinje?), 1♀ ad. cw 47.8 (ovig.), Eimer coll. (ZSM 1518/3 ex 1200/5); Southern Africa, Mozambique (formerly Portuguese East Africa), Charre, north of Sena (=Vila de Sena) on the Zambezi river, Paratype, 1♀ subad. cw 25.5, Cott coll. (ZSM 1518/6 ex 1201/1, don. NHML Nr. 1933); Southern Africa, probably Mozambique, 1♀ ad. cw 40.3, 1♂ ad. cw 42.9 (ZSM 1518/5 ex 1200/7).

Comments. *Potamonautes obesus* and *P. calcaratus* share a number of characters and are considered here to belong to the same species. The sidewalls are divided into two parts and are smooth; there is no vertical groove on the ischium of the third maxilliped, and the male abdomen is a broad triangle. The

first gonopods of the two taxa (shown in Pretzmann 1977) are somewhat similar. There are, however a number of minor difference between these two taxa, which may be attributed to the isolation of the northern and southern populations in Somalia and Mozambique respectively.

Potamonautes paecilei (A. Milne-Edwards, 1886)

Thelphusa Paecilei A. Milne-Edwards, 1886: 149; *Potamon paecilei*, Chace 1942: 218; Capart 1954: 841-842, figs 34, 37; *Potamonautes* (*Longipotamonautes*) *paecilei*, Bott 1955: 242-243, figs 21, 71, pl. 6, figs 2a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Equateur Province, Binga, Mongala river (right tributary of the Congo river), 1♂, van den Put coll. (ZSM 1202/1, alte ZSM Nr. 1935, don. MRAC).

Comments. The complete synonymy is provided by Bott (1955). *Potamonautes paecilei* is found in the rain forest zone from Nigeria to lower Zaire. This species was listed by Balss (1936) as *Potamon* (*Potamonautes*) *campi* but these specimens are judged here to belong to *P. paecilei*.

Potamonautes perlatus (H. Milne Edwards, 1837)

Thelphusa perlata A. Milne-Edwards, 1837: 13; *Potamon perlatus*, Chace 1942: 219; Capart 1954: 842, figs 18, 38; *Potamon* (*Potamonautes*) *perlatus*, Barnard 1950: 183-187, figs 34a, 35a-c; *Potamonautes* (*Potamonautes*) *perlatus perlatus*, Bott 1955: 254, pl. 11, figs 2a-c, 3, fig. 26.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), Kinda south of Kamina, Katanga District, 1♂ ad. cw 48.5, Charliers coll. (ZSM 1203/1); Kapiri river, tributary of the Lufira river, in the region of Likasi (formerly Jadotville), Katanga District, 1♂ ad. cw 46.9, G. F. de Witte coll. (ZSM 1203/2, alte ZSM Nr. 1935, don. MRAC). Southwest Africa, Namibia (formerly German Südwestafrika) Swakopmund, 1♂ cw 43.8, 1901, Bürkel coll. (ZSM 1203/3); Windhoek (formerly Windhuk), "aus einem Quellbach im Truppengarten, angeblich hier eingesetzt, aus anderem Gewässer des Schutzgebietes stammend" (Balss, 1922), 1♂ ad. cw 49.43, 1♀ subad. cw 44.2, 03.05.1911, W. Michaelsen coll. (ZSM 1203/4). South Africa (formerly Kapland), Port Elisabeth, Kap der Guten Hoffnung (=Cape of Good Hope), "Bach in der Nähe des Kaffernkrals" nach Doflein (1904), 1♂ juv. cw 24.6, 1904; Natal is not correct), 1898-1899, "Valdivia" – Expedition coll. (ZSM 1203/5); Kaapstad (=Cape Town) (formerly Kapstadt), Kap der Guten Hoffnung (=Cape of Good Hope), 1♂ ad. cw 54.2, Roemer (ZSM 1203/6); Natal Province, 1♀ ad. cw 70.6 (hatchlings cw 2.78), 1909, Langenheim (ZSM 1203/7).

Comments. This species is found in the southern part of Central Africa (in the south eastern region of the Democratic republic of the Congo) and in southern Africa (Namibia and South Africa).

Potamonautes perparvus (Rathbun, 1921)

Potamon (Geothelphusa) perparvus Rathbun, 1921: 425-427, fig. 12, pl. 28, fig. 2, pl. 30, figs 1-3; *Potamonautes* (*Lobopotamonautes*) *perparvus perparvus*, Bott 1955: 283-284, fig. 47, pl. 21, figs 1a-d.

Material. East Africa, Rwanda, SW-Ruanda, Rukarara river, southeast of Lake Kivu, 1♀ subad. cw 14.4), 8.1907 (ZSM 1204/1).

Comments. *Potamonautes perparvus* can be recognised by a faint postfrontal crest, a low exorbital angle, and a low or absent epibranchial tooth; both of the latter two features are continuous with the anterolateral margin.

Potamonautes platynotus (Cunnington, 1907)

Potamon (*Potamonautes*) *platynotus* Cunnington, 1907: 264-266, pl. 17, figs 1-2; *Potamonautes* (*Platypotamonautes*) *platynotus*, Bott 1955: 235-236, 235, fig. 12, 66, pl. 4, figs 1a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), formerly Rutuku-Ganjia, south of Kalemie (formerly Albertville) western shore of Lake Tanganyika, 1♀ ad. cw 50.2 (ovig. eggs 1.27 diameter), L. Stappers coll. (ZSM 1205/1 alte ZSM Nr. 1935, don. MRAC); western shore of Lake Tanganyika, 3♂♂ juvs. cws 29.4, 19.2, 14.9, L. Stappers (or Glauning) coll. (ZSM 1205/2); Mondombe, near Ikela, forest of Mondombe, forest stream, 1♂ juv, 11.1922 (ZSM 1205/3).

Comments. This species is endemic to Lake Tanganyika.

Potamonautes sidneyi (Rathbun, 1904)

Potamon (*Potamonautes*) *Sidneyi* Rathbun, 1904: **???**, pl. 14, fig. 3; 1905: 165; *Potamon* (*Potamonautes*) *sidneyi*, Barnard 1950: 189, fig. 34b; *Potamonautes* (*Orthopotamonautes*) *sidneyi*, Bott 1955: 278-279, 235, fig. 46, pl. XX, figs 1a-d.

Material. South Africa, Zululand-District, Lake Sibayi, 1♂ ad. cw 44.6, 1♀ subad. cw 35.9 (ZSM 1206/1, don. MLü 1114/245, Museum Gothenburg).

Comments. *Potamonautes sidneyi* is a large species that resembles *P. perlatus* in some respects but the first gonopod of each of these species is different. *Potamonautes sidneyi* is restricted to Natal province of South Africa (Barnard, 1950).

Potamonautes suprasulcatus (Hilgendorf, 1898)

Thelphusa suprasulcata Hilgendorf, 1898: 8-9, pl. 5, figs 5, 5a-d; *Potamonautes* (*Arcopotamonautes*) *suprasulcatus suprasulcatus*, Bott 1955: 270-272, 235, fig. 40, pl. 17, figs 1a-d.

Material. East Africa, Tanzania, Mount Kilimandjaro, 1♂ juv. cw 27.4, 1♀ subad. cw 43, 1952, N. Pavlitzki coll. (ZSM 1207/1); in a river flowing into Lake Manyara, west of Arusha, freshwater, 1♂ ad. cw 57.3, 1♀ ad. cw 49.5, 29.01.1960, J. Popp, coll. (ZSM 1207/2).

Comments. *Potamonautes suprasulcatus* resembles *P. johnstoni* in some respects but the first gonopod of each of these species is very different.

Potamonautes walderi (Colosi, 1924)

Potamon (*Potamonautes*) *Walderi* Colosi, 1924: 8-9, figs 5, 5a, 5b; *Potamonautes* (*Tripotamonautes*) *walderi*, Bott 1955: 264, figs 32, 33, pl. 13 figs 2a-d.

Material. Central Africa, the Democratic Republic of the Congo (formerly Zaire and the Belgian Congo), formerly Kai Bumba, Majumbe-District, Lower Congo river (probably Kai Nduna = Kai Ndunga, Mayumbe-District, between Boma and Tshela, Congo river mouth), 1♂ cw 29.9, 10.10.1920, H. Schouteden coll. (ZSM 1208/1 alte ZSM Nr. 1936, don. MRAC); formerly Kai Bumba, Mayumbe-District, Lower Congo river (probably Kai Nduna = Kai Ndunga, Mayumbe-District, between Boma and Tshela, Congo river mouth), 1♂ ad. cw 28.4, 1♂ juv. cw 22.5, 10.1920, H. Schouteden coll. (ZSM 1208/2 ex 1185/2).

Comments. The complete synonymy is provided by Bott (1955). *Potamonautes walderi* is recognised by a distinct gonopod 1 whose terminal segment has a large medial fold, about twice as high as the lateral fold. *Potamonautes walderi* is found in the rivers of the lower Congo river basin.

Liberonautes Bott, 1955

Liberonautes Bott, 1955: 306.

Liberonautes latidactylus (de Man, 1903)

Potamon (*Potamonautes*) *latidactylum* de Man, 1903: 41-47, pl. 9, figs 1-6; *Liberonautes latidactylus*, Bott 1955: 306-308, pl. 29, figs 102, 103; *Liberonautes latidactylus latidactylus*, Cumberlidge & Sachs 1989a: 221-230: figs 1, 2; 1989b: 425-439: fig. 1, tab. 1.

Material. West Africa, Liberia, Fulba? 1♂ juv. cw 20, 1♀ juv. cw 33, 08.1908, Scherer (ZSM 1527/1 ex 1174/1); formerly Millsburg, St. Paul river near Monrovia, 2♂♂ juvs. cws 14, 11, Scherer coll. (ZSM 1527/2 ex 1174/3); 3♀ adults cws 58, 50, 62 (hatchlings), 1♀ subad. cw 46, 3♂ ♂ subads. cws 50, 42, 48, Scherer coll. (ZSM 1527/3 ex 1174/4).

Comments. *Liberonautes latidactylus* is the commonest freshwater crab in the West African region west of Ghana. These localities fall within the known range of this species (Cumberlidge 1998).

Sudanonautes Bott, 1955

Sudanonautes Bott, 1955: 295-296.

Sudanonautes aubryi (H. Milne Edwards, 1853)

Thelphusa aubryi H. Milne Edwards, 1853: 210; *Sudanonautes aubryi*, Cumberlidge 1994b: 225-241.

Material. West Africa, Togo, 1♂ adult, cw 65 (with *S. granulatus*), 02.1905, Graf Zech coll. (ZSM 1525/6 ex 1214/9); Sokodé, flowing water, 2♂♂ subads. cws 40, 37, 7 juvs., cws 12.5-29, Schröder coll. (ZSM 1525/7 ex 1214/2, don. ZMB 1928); Misahöhe, near Palimé, north of Klouto, 1♂ cw 26 (caught together with six *S. granulatus*) Baumann coll. (ZSM 1525/8 ex 1214/8, don. ZMB 1928); formerly Bismarckburg, near Blitta, 1♀ adult cw 73, 02.1905, Büttner coll. (ZSM 1525/9 ex 1214/10, don. ZMB 1928). Central Africa, Cameroon, Yaounde, 1♀ adult cw 56 (ovig.), von Carnap coll. (ZSM 1525/4 ex 1214/5); Bipindi, near the Lokoundié river, northwest of Ebolowa, 1♂ adult cw 51 (together with *S. granulatus*), Zenker coll. (ZSM 1525/5 ex 1214/3, don. ZMB 1928); Barombi station by Barombi lake, near Kumba, formerly Johann-Albrechtshöhe, north of Mount Cameroon, captured in rice field, 1♀ adult cw 51, 1♀ subad. cw 34, Preuss coll. (ZSM 1525/1 ex 1214/4), don. ZMB, 1928); Victoria (= Limbé) south of Mount Cameroon, 1♀ subad. cw 36, 06.10.1912, E. Fickendey coll. (ZSM 1525/3 ex 1214/6 don. Mus. Hamburg); 1♀ subad. cw 38, 1 juv. damaged, 1908, Haberer coll. (ZSM 1525/2 ex 1214/7).

Comments. The genus *Sudanonautes* occurs in West and Central Africa and includes 10 species (Cumberlidge 1991, 1993a,b, 1994b, 1995a-d, 1998). Seven species of this genus are represented in the collection, four from Cameroon, one from Nigeria, and one from the Republic of the Congo. *Sudanonautes aubryi* is a large species that is widespread and common in West and Central Africa. However, for a long time this species had been confused with other superficially similar species found in the same region. Details of the complete synonymy, identification, distribution and ecology of *S. aubryi* are provided in the redescription by Cumberlidge (1994b).

Sudanonautes africanus (A. Milne-Edwards, 1869)

Thelphusa africana A. Milne-Edwards, 1869: 186, pl. 11, figs 2, 2a; *Sudanonautes africanus*, Cumberlidge 1995a: 588-598, figs 1-3, tab. 1.

Material. Central Africa, Cameroon, Yaounde, 1 juv. cw 18, Zenker coll. (ZSM 1209/1, donated by MRAC 19357); Barombi station by Barombi lake near Kumba, formerly Johann-Albrechtshöhe, north of Mount Cameroon, 2♀♀ subads. cw 57, 49, Preuss coll. (ZSM 1209/2, exchange ZMB 1911/4379). Zaire, Lower Congo, Kidada near Kitobola, river Lukunga, lower Congo river, southwest of Thysville, 1 juv. cw 28, 15.02.1922, Schouteden coll. (ZSM 1209/3, alte ZMS Nr. 1935, don. MRAC 1935); formerly Kai Bumba, Maumbe district, between Boma and

Tshela, lower Congo river, tributary of the river Chilongo, 1♂ subad. cw 39, 10.10.1920, Schouteden coll. (ZSM 1209/4, alte ZSM Nr. 1935, don. MRAC 1935). Africa, 1 ??? subad. cw 69 (ZSM 1209/5).

Comments. This large species is abundant in Central Africa and in the rain forest regions of southeast Nigeria. Like *S. aubryi*, the identification of *S. africanus* has often proved difficult due to its confusion in the literature with other similar-looking species found in the same region. Details of the complete synonymy, identification, distribution and ecology of this species are provided in the redescription by Cumberlidge (1995a).

Sudanonautes chavanesii (A. Milne-Edwards, 1886)

Thelphusa Chavanesii A. milne-Edwards, 1886: 150; *Sudanonautes chavanesii*, Cumberlidge 1995b: 238-246, figs 1-3.

Material. Central Africa, Cameroon, Boedou, near Banyo, 1♀ subad. cw 47, 1♂ adult cw 49, Riggenbach coll. (ZSM 1526/1 ex 1210/1, alte ZSM Nr. 1928, don. ZMB 1928); Foumban, vicinity of Dschang, 1♂ subad. cw 47, 1♂ juv. cw 28, Th. Monod coll. (ZSM 1526/2 ex 1210/2 alte ZSM Nr. 1928, don. MNHN).

Comments. *Sudanonautes chavanesii* was recently redescribed by Cumberlidge (1995b, 1998) who provided details of the complete synonymy, identification, distribution and ecology of this species.

Sudanonautes floweri (de Man, 1901)

Potamon (Potamonautes) Floweri de Man, 1901: 94-101, pl. 10; *Sudanonautes floweri*, Cumberlidge 1995d: 111-119, figs 1-3, tab. 1.

Material: Central Africa, Cameroon, 1♀ subad. cw 28,; 1♀ subad. cw 28 (ZSM 1524/6 ex 1174/2); Victoria (= Limbé), 1♀ subad. cw 33, 1898-1899, "Valdivia" coll. (ZSM 1524/4 ex 1211/2); Bibundi, west of Mount Cameroon, 2♂♂ adults cws 46, 45, 1♀ adult cw 38, 1♀ subad. cw 30, 1♂ juv. cw 32, Retzlaff coll. (ZSM 1524/5 ex 1211/3). Zaire, Bambesa, Upper Uele river, 2♂♂ adults cws 46, 45, 2♀♀ adults, cws 42, 38, 2♂♂ juvs. cws 32, 22, 14 10.1933, H. J. Bredo coll. (ZSM 1524/1 ex 1212/1 alte ZSM Nr. 1935/1, don. MRAC 1935/1); Monbuttu? (near the upper Uele) between Kibali and the Ituri river, west of Lake Albert southeast of the river Uele, 1♀ subad. cw 29, Schweinfurth coll. (ZSM 1524/2 ex 1212/2); Monbuttu? (near the upper Uele) between Kibali and the Ituri river, west of Lake Albert southeast of the river Uele, 1♀ subad. cw 34, Schweinfurth coll. (ZSM 1524/3 ex 1211/1, alte ZSM Nr. 1928, don. ZMB, 1928).

Comments. *Sudanonautes floweri* is a widespread species found in savanna regions from Nigeria to Sudan, and in rain forest regions from Nigeria to Zaire. This species was recently redescribed by Cumberlidge (1995d, 1998), who provided details of the complete synonymy, identification, distribution and ecology of this species.

Sudanonautes faradjensis (Rathbun, 1921)

Potamon (Acanthothelphusa) faradjensis Rathbun, 1921: 428-430, pl. 31, fig. 13; *Sudanonautes faradjensis*, Cumberlidge 1995c: 629-636, figs 1-3.

Material. Central Africa, Cameroon, Bipindihof, Zenker, 1♂ adult cw 34, 2♀♀ adults cws 34, 33.8 (ZMB 10359); Boedou, subdivision of Banyo, stream, 1♂, 1♀, Riggenbach coll. (ZSM 1526/1 ex 1210/1 alte ZSM Nr. 1928, don. ZMB); Foumban, Dschang district, 1♂, Th. Monod coll. (ZSM 1526/2 ex 1210/2, alte ZSM Nr. 1928, don. MNHN).

Comments. This species was recently redescribed by Cumberlidge (1995c, 1998) who provided details of the complete synonymy, identification, distribution and ecology of this species. This large species is restricted to the rivers of the rain forest region of Central Africa between Cameroon and lower Congo.

Sudanonautes monodi (Balss, 1929a)

Potamonautes aubryi monodi Balss, 1929a: 123, fig. 4 (Laro); *Potamon monodi*, Chace 1942: 217; Capart 1954: 823, figs 9, 29; *Sudanonautes* (*Convexonautes*) *aubryi monodi*, Bott 1955: 306, fig. 101; Monod 1977: 1281, figs 108-109; 1980: 385.

Material. Central Africa – Cameroon, north Cameroon, Laro, by the river Deo, 2♂♂ adults cws 43, 40, syntypes, 1929a, Th. Monod coll. (ZSM 1213/1).

Comments. *Sudanonautes monodi* is restricted to the drier parts of the savanna from Togo to Chad. These specimens from Garoua in northern Cameroon are close to the type locality (Maroua near Garoua). This species was considered by Bott (1955) and Monod (1977, 1980) to be a subspecies of *S. aubryi*. Cumberlidge (1994b, 1995d, 1998) recently redescribed *S. aubryi* and *S. floweri* and recognised *S. monodi* as a valid species.

Sudanonautes granulatus (Balss, 1929a)

Potamonautes decazei granulata Balss, 1929a: 119; *Sudanonautes granulatus*, Cumberlidge 1993c: 805-816, figs 1a-d. 2a-d, 3a-m, 4a-j, 6a-b, 7.

Material. West Africa, Togo, Misahöhe, near Palimé, north of Klouto, 6♂♂ cw 25-16 (collected with 1♂ *S. aubryi*), Baumann coll. (ZSM 1523/1 ex 1214/8) – Togo, 1♂ adult cw 25 (collected with *S. aubryi*), 02.1905, Graf Zech (ZSM 1523/3 ex 1214/9). Central Africa, Cameroon Bipindi near the Lokoundié river, northwest of Ebolowa, 1♂ adult cw 31, 1♀ adult ovigerous cw 35, 4 subads. cws 25, 15, 12, 9 (collected with *S. aubryi*), Zenker coll. (ZSM 1523/5 ex 1214/3, alte ZSM Nr. 1928, don. ZMB 1928); Bafia near the Mbam river, northwest of Yaounde, 1♂ subad. cw 21, Leiderer coll. (ZSM 1523/4 ex ZSM Ein. Nr. 657).

Comments. *Sudanonautes granulatus* has a disjunct distribution in West Africa, and is found in the rain forest regions of Cameroon, Nigeria and Côte d'Ivoire. This species was recently redescribed by Cumberlidge (1993c, 1998).

Potamonemus Cumberlidge & Clark, 1992

Potamomemus Cumberlidge & Clark, 1992: 149.

Potamonemus mambilorum Cumberlidge & Clark, 1992

Potamonemus mambilorum Cumberlidge & Clark, 1992: 149, figs 1-3, tabs 1-2, pl. 1; Cumberlidge 1993a: 582-584, figs 5e-f, 6g-i, tab. 3.

Material. Cameroon, Foumban, region of Dschang, 2♀♀ adults cw 34, 28, 1♀ subad. cw 22.5, Th. Monod coll. (ZSM 1520/1 ex 1176/1, alte ZSM Nr. 1928/4, don. MNHN).

Comments. There are three species in this genus (Cumberlidge & Clark 1992, Cumberlidge 1993b); two of them are represented in the collection of the ZSM. *Potamonemus mambilorum* is found only in southwest Cameroon.

Potamonemus sachsi Cumberlidge, 1993b

Potamonemus sachsi Cumberlidge, 1993b: 571-576, figs 1, 2, 5c-d, 6d-f, 7; tabs 1, 3.

Material: Central Africa, Cameroon, Bura, 1♀ adult cw 22, Bigge coll. (ZSM 1521/1 ex 1176/3).

Comments. This species has a disjunct distribution and is found in southwest Cameroon, Nigeria and Togo.

Louisea Cumberlidge, 1994a

Globoneutes Bott, 1959: 999; *Louisea* Cumberlidge, 1994a: 124-125.

Louisea edeaensis (Bott, 1969)

Globonautes macropus edeaensis Bott, 1969: 360; 1970b: 24, pl. 1, figs 3-5, pl. 26, fig. 8; Cumberlidge 1987: tab. 1; *Louisea edeaensis,* Cumberlidge 1994: 124-125, fig. 1, tab. 1.

Material. Central Africa, Cameroon, Edea, 1♂ adult, cw 22. 52, Holotype, 01.1910 (ZSM 1118/1).

Comments. This species was described by Bott (1969, 1970b) as *Globonautes macropus edeaensis* and was assigned to the Gecarcinucidae. Cumberlidge (1994a) redescribed this taxon as *Louisea edeaensis*, and reassigned it to the Potamonautidae. All known specimens of *L. edeaensis* were collected before 1910, and it is of some concern that this unusual species has not been seen for over 90 years.

Louisea balssi (Bott, 1959)

Geothelphusa macropus Balss, 1914a: 406; 1936: 200 (part.); *Globonautes balssi* Bott, 1959: 999-1000, fig. 7; Cumberlidge 1987: 2210-2212; *Globonautes macropus balssi,* Bott 1969b: 360; 1970b: 24, pl. 1, figs 3-5, pl. 26, fig. 8; *Louisea edeaensis,* Cumberlidge 1994a (part): 127, 130, figs 2, 3, tabs 1, 2.

Material. Cameroon, formerly Esosung, Bakossi region, Kumba (formerly Johann-Albrechtshöhe), 1060m, 1♀ adult cw 21, Carl Rathke coll. (ZSM 1117/1).

Comments. *Louisea balssi* was recently recognised as a valid species by Cumberlidge (1998). Prior to that, *L. balssi* had been considered as either *incertae sedis* (Cumberlidge 1994a) or as a subspecies of *G. macropus* (Bott 1969, 1970b).

Platythelphusa A. Milne-Edwards, 1887

Platythelphusa A. Milne-Edwards, 1887: 146: *Potamonautes* (*Platythelphusa*), Bott 1955: 226.

Comments. *Platythelphusa* is treated here as a valid genus, and the subgenus and subspecies categories of Bott (1955) are not recognised. There are at least six species of *Platythelphusa* in Lake Tanganyika (Capart 1952); two of these are represented in the collection of the ZSM.

Platythelphusa armata A. Milne-Edwards, 1887

Platythelphusa armata A. Milne-Edwards, 1887: 147, pl. 9, figs 10-10d; *Platythelphusa armata*, Capart 1952: 44-48, figs 1, 7a, 10; *Potamonautes* (*Platythelphusa*) *armata armata*, Bott 1955: 226-227, pl. 2, figs 1a-d, 9a-b.

Material. East Africa, Burundi (formerly German East Africa), Bujumbura (formerly Usumbura), northern part of Lake Tanganyika, 1♀ ad. cw 43.5, Grauer coll. (ZSM 1529/2 ex 1177/2); Tanzania (formerly German East Africa), 1♂ juv. 16.7, L. Stappers coll. (ZSM 1529/1 ex 1177/1).

Comments. Bott (1955) synonymized *P. armata* with *Limnothelphusa maculata* Cunnington, 1899. However, comparison of the type of *P. armata* with Cunnington's type of *L. maculata* indicates that these two taxa do not belong to the same species. It is likely that each is, in fact, a valid species (Capart 1952).

Platythelphusa maculata Cunnington, 1899

Limnothelphusa maculata Cunnington, 1899: 698, pl. 38; Moore 1903: 280; Rathbun 1905: 269; *Platythelphusa maculata,* Cunnington 1907: 271, pl. 5-6; Balss 1936:196; Chace 1942: 225; Capart 1952: 52-55, figs 5, 6, 7f,g; *Potamonautes* (*Platythelphusa*) *armata armata*, Bott 1955: 226-229, figs 9a-b, pl. 2, figs 1a-d.

Material. East Africa, Tanzania (formerly German East Africa), probably Lake Tanganyika, 1♀ ad. cw 15, L. Stappers coll. (ZSM 1530/1 ex 1177/1).

Comments. Bott (1955) followed the opinion of Balss (1936) that *L. maculata* described by Cunnington (1899) was in fact a juvenile form of *P. armata* and treated *P. maculata* as a synonym of *P. armata*. However, the specimens of *P. maculata* reach maturity at an extremely small size (some adults have a cw of only 15), which argues against their inclusion in *P. armata*, where adult animals have a cw of 35-45, and specimens of cw 15 would be juveniles. The specimen of *P. maculata* (ZSM 1530/1) was caught together with specimens of *P. armata* (ZSM 1529), and this material has now been divided into separate lots. *Platythelphusa maculata* is recognised here as a valid species following comparison of the type material of *P. armata* and *P. maculata*.

Gecarcinautes Bott, 1960

Gecarcinautes Bott, 1960: 15; 1965: 336; *Bottia* Pretzmann, 1961: 162 (part).

Gecarcinautes goudoti (H. Milne Edwards, 1853)

Thelphusa Goudoti H. Milne Edwards, 1853: 212; *Gecarcinautes goudoti*, Bott 1965: 338-339, pl. 2, figs 6, 7.

Material. Madagascar, Indian Ocean, Forest, Vallée de la Manambato (valley of Manambato), north of the Tsaratanana Mountains, 1♂ cw 23.6 (ZSM 1532/1 ex 1159/1, don. MNHN Nr. 831); Lake Alaotra, north of Antananarivo (formerly Tananarive), 3♂♂ ads. cw 46.8, 41,4, 32.8, 1♀ ad. 31.2, Voeltzkow coll. (ZSM 1532/2 ex 1159/2, don. MLü Nr. 1121/24); Toamasina (formerly Tamatave), 1♀ subad. cw 20.9, J. Millot coll. (ZSM 1532/3 ex 1162/1, alte ZSM Nr. 1928, don. MNHN Nr. 422).

Comments. The complete synonymy is provided by Bott (1965). *Gecarcinautes goudoti* is recognised as a valid species on the basis of characters of the carapace and gonopod 1. Bott (1965) referred *G. goudoti* to the subfamily Gecarcinucinae in the family Potamonidae. Bott (1969, 1970b) later included the African and Indian species of Gecarcinucinae in the family Gecarcinucidae, but made no mention of the Madagascan fauna. Comparison of the mandibular palp of *G. goudoti* with that of *Hydrothelphusa agilis* and *H. madagascariensis* indicates a close correspondence between all three taxa, and does not appear to warrant the assignment of *G. goudoti* to a different genus, subfamily, and family. A definitive judgement, however, awaits a detailed study of the entire Madagascan freshwater crab fauna.

Hydrothelphusa H. Milne-Edwards, 1872

Hydrothelphusa A. Milne-Edwards, 1872: 2; *Bottia* Pretzmann, 1961: 162.

Hydrothelphusa madagascariensis (A. Milne-Edwards, 1872)

Thelphusa madagascariensis A. Milne-Edwards, 1872: 1; *Hydrothelphusa agilis madagascariensis*, Bott 1965: 341-342, pl. 3, figs 10-11.

Material. Madagascar, Indian Ocean, Bijofo? Biosso?, 1♀ ad. cw 34.7, Decary coll. (ZSM 1533/2 ex 1162/2, alte ZSM Nr. 1928, don. MNHN); Toamasina (formerly Tamatave), 1♀ ad. cw 61.7, Dr. J. Millot coll. (ZSM 1533/1, ex 1162/1 (split lot), alte ZSM Nr. 1928, don. MNHN Nr. 422).

Comments. Bott (1965) recognised two species of *Hydrothelphusa* (*H. agilis* and *H. humbloti*) and two subspecies of *H. agilis*: *H. a. agilis* and *H. a. madagascariensis*. *Hydrothelphusa madagascariensis* is considered to a valid species on the basis of a number of differences between *H. agilis* and *H. madagascarensis*.

Hydrothelphusa humbloti (Rathbun, 1904)

Potamon (*Potamon*) *humbloti* Rathbun, 1904: 297-298, pl. 12, fig. 10; *Potamon* (*Potamon*) *bombetokensis* Rathbun, 1904: 298, pl. 12, fig 6; Balss 1929a: 354; *Hydrothelphusa humbloti*, Bott 1965: 342-344, pl. 3, figs 12-13, figs 5-6.

Material. Madagascar, Indian Ocean, Farafangana, 1♂ ad. cw 41.9 (ZSM 1534/1 ex 1153/1, alte ZSM Nr. 1928, don. MNHN).

Comments. This species was recognised by Bott (1965) who considered *Potamon* (*P.*) *bombetokensis* Rathbun, 1904 to be a junior synonym.

Potamon (Parathelphusa) antongilensis Rathbun, 1905

Potamon (Parathelphusa) antonigilensis Rathbun, 1905: 265-266, fig. 21, pl. 12, fig. 5; *Hydrothelphusa (Acanthothelphusa) antongilensis*, Bouvier 1921: 32, *Potamon (Geothelphusa) antongilensis*, Balss 1929a: 355, fig. 2, *Gecarcinautes antongilensis antongilensis*, Bott 1965: 337-338, figs 1-3, pl. 1. figs 1-3.

Material. Madagascar, Indian Ocean, Toamasina (formerly Tamatave), 2♂♂ ads. cws 30.7, 30.4, 2♂♂ juvs. cws 18.9, 15.8, 3♀♀ ad. 31.2 (ovig.), 29.0 (ovig.), 30.1, 1♀ subad. cw 23.5, Dr. J. Millot coll. (ZSM 1531/1, ex 1151/1).

Comments. These specimens correspond well with the type of *Potamon (P.) antongilensis* Rathbun, 1905 but it is difficult to assign them with any confidence to a genus. Balss (1929a) listed this species as *Potamon* (*Geotelphusa*) *antongilensis*, while Bott (1965) considered this species to be *Gecarcinautes a. antongilensis* (Rathbun, 1905).

Potamon (Geothelphusa) ankaraharae Nobili, 1906

Potamon (Geothelphusa) ankaraharae Nobili, 1906: 1-4, fig. A; *Parathelphusa (Barythelphusa) ankaraharae*, Colosi 1920, 22; *Potamon (Geohtelphusa) ankaraharae*, Balss 1929a: 356; *Madagapotamon ankaraharae*, Bott 1965: 347-348, fig. 9, pl. 5, figs 23-25.

Material. Madagascar, Indian Ocean, Antsiranana (formerly Diego= Diégo-Suarez), 1♂ ad. cw 27.2, 1♀ ad. cw 25.7, 2 subads., cw 21.7 (♂), cw 19.4 (♀), J. Millot coll. (ZSM 1475/1, alte ZSM Nr. 1928).

Comments. These specimens were listed by Balss (1929a) as *Potamon (Geothelphusa) ankaraharae* and by Bott (1965) as *Madagapotamon ankaraharae*. These specimens are close in a number of respects to *Skelosophusa prolixa* Ng. & Takeda, 1994, and similarities in the gonopods and carapace characters would support this. However, the legs of the specimens in the ZSM are not elongated and the ischium of the third maxilliped is smooth and lacks a vertical sulcus. Furthermore, there is a distinct anterior process on the terminal segment of the mandibular palp in these specimens. Ng & Takeda (1994) describe the terminal segment of the mandibular palp of *S. prolixa* as simple, but their illustrations indicate a small but distinct anterior process. Significant differences in characters of the carapace argue against the inclusion of these specimens in either *Gecarcinautes*, *Hydrothelphusa* and *Madagapotamon*, despite Bott's (1965) referral of these specimens to the latter genus.

Potamon (Potamon) pittarrelli Nobili, 1905

Potamon (Potamon) pittarrelli Nobili, 1905: 1-4, fig. 1.

Material. Madagascar, Indian Ocean, Grotte de la Mananjiba, Ankarana district, Ambilobé,1924, 2 **???** juvs. cws 12.8, 11.6, Waterlott coll. (ZSM 1163/1).

Comments. These specimens conform in many respects to the genus *Skelosophusa* in that the mandibular palp has two segments, the terminal segment of the mandibular palp is simple, and the walking legs are extremely long and thin. However, both of these specimens are juveniles and without a knowledge of the form of the adult gonopods it is difficult to make a definitive identification.

Zusammenfassung

Die Sammlung der Süßwasserkrabben Afrikas und Madagaskars in der Zoologischen Staatssammlung, München, wurde überprüft. Die Sammlung enthält 28 Arten der Gattung *Potamonautes*, 7 Arten von *Sudanonautes*, je zwei Arten von *Platythelphusa*, *Hydrothelphusa*, *Deckenia*, *Potamonemus*, und *Louisea* und je eine Art von *Liberonautes*, *Gecarcinautes* and *Potamon*. Ferner sind in der Sammlung der Holotypus von *Louisea edeaensis* und die Paratypen von *L. balssi*, *Sudanonautes monodi* und *Potamonautes gerdalensis* vorhanden.

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Redescriptions of terrestrial Isopoda from Chile and Peru

(Crustacea, Isopoda, Oniscidea)

Andreas Leistikow

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A redescription of the type material of *Andenoniscus silvaticus* Verhoeff, 1941 and *Araucoscia chilenica* Verhoeff, 1939 from western South America is given and all mentioned characters are depicted. The examined material from the Zoologische Staatssammlung München represents the remainder of the samplings Verhoeff originally worked on. The generic diagnoses are completed to allow phylogenetic comparison with other "philosciid" Oniscidea.

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Introduction

Our knowledge on the isopod fauna of South America is full of gaps and vast regions of this continent are still white patches especially concerning research on Oniscidea. It is very difficult to make an elaborate analysis of the phylogeny of the interesting diversity of terrestrial isopods since most descriptions are rather superficial. Especially the contributions of K. W. Verhoeff and A. Vandel are often seemingly intuitive and it is almost impossible to imagine the species examined by the authors (e.g. Vandel 1968 or 1973, Verhoeff 1939 or 1941). To provide a character set as voluminous as possible, two species of "philosciid" Oniscidea from western South America are redescribed: *Andenoniscus silvaticus* Verhoeff, 1941 and *Araucoscia chilenica* Verhoeff, 1929. As far as possible, characters are chosen which reveal most information for generic diagnosis as indicated by Taiti & Ferrara (1980).

Species account

Genus *Andenoniscus* Verhoeff, 1941

Diagnosis. Cephalothorax with linea frontalis, antenna with three-articulate flagellum. Molar penicil of mandible semi-dichotomized, lateral endite of maxillula bearing 4+4 teeth, the inner set cleft, maxilla with lateral lobe setose, medial lobe cuspidate, endite of maxilliped lacking knob-like penicil and setation.
Pereopods rather weakly sclerotized, dactylus with flagelliform dactylar seta and short inner claw. Coxal plates with sulcus marginalis, lacking in at least coxal plate 1, no gland pores, noduli laterales present with d/c maximum on coxal plate IV. Pleopod exopodites with straight lateral margins, uropod endopodite inserting slightly proximally of exopodite.

Type species. *Andenoniscus silvaticus* Verhoeff, 1941 (by monotypy and original designation).

Andenoniscus silvaticus Verhoeff, 1941
Figs 1-2

Material. Microscopic slides of a male specimen, the only material remaining: Peru, Sivia, 520 m, native forest, Zoologische Staatssammlung München (ZSM), designated **Lectotype**.

Description

Colour. Verhoeff (1941) stated that the dorsal colouration was brown and gray.

Cephalothorax. Linea frontalis present, presence of linea supra-antennalis not described (Verhoeff 1941). Compound eyes of less than 10 ommatidia (Verhoeff 1941).

Pereon. Smooth, sparsely covered with setae (Verhoeff 1941). Coxal plates without gland pores, mounted material: coxal plate 1 without, coxal plate 7 with sulcus marginalis, both bearing noduli laterales (Fig. 1, Cx1/7).

Pleon. Retracted from pereon, pleotelson with almost straight lateral margins (Fig. 1, Tel).

Antennula. Three-articulate, distal article bulbous with set of aesthetascs medially and few aesthetascs apically (Fig. 1, An1).

Antenna. Three flagellar articles, subequal in length, apical organ broken, peduncular articles 4 to 5 subequal in length to flagellum (Fig. 2, An2).

Mandible. Only left mandible mounted, setation of pars intermedia partially removed, one short penicil present, molar penicil semi-dichotomized, about 5 branches of different length (Fig. 1, Mdl).

Maxillula. No medial endite available, lateral endite with 4+4 teeth, inner set cleft (Fig. 1, Mx1).

Maxilla. Lateral lobe surpassing medial one, setose, medial lobe with a row of cusps apically (Fig. 1, Mx2).

Maxilliped. Basipodite with laterodistal edge rather rectangular, scattered tricorn-like setae, lateral to proximal border accompanied by slight sulcus lateralis. Endite lacking dense setation, setal tuft rostrally, caudally bearing two teeth. Palp significantly three-articulate, unless denied by Verhoeff (1941), medial margin of article 2 with setal tuft distally and set of long and short seta proximally (Fig. 1; Mxp).

Pereopods. Male pereopods 1 and 7 the only remaining, dactylus with flagelliform dactylar seta, long interungual seta and short inner claw. Carpus with setal tuft laterodistally, antenna-grooming brush on carpus 1, as its counterpart longitudinal row of hyaline setae medially on propus 1, ornamental sensory spine of carpus 1 with double fringed apex (Fig. 2, PE1/PE7).

Sexual differentiation. Unless new material or the lost samplings are found, remaining unknown. Male pereopod 7 merus with serrate lobe mediodistally, may be sexually dimorphic.

Pleopods. Exopodites with straight lateral margin, bearing some sensory spines, endopodites somewhat smaller, lobate. No respiratory areas discernible in light microscope at 400× magnification (Fig. 2, PL1-3).

Sexual differentiation. Male pleopod 1 with rounded exopodite (Verhoeff 1941), endopodite stout, apex bulbous with a small lateral hook, pointing laterodistally, row of spiniform setae rather short, proximally beginning at ⅘ of the endopodite's length, crossing transversely to tip of hook, distally of setal row scattered spines, on caudal surface of apex inserting a presumably motile, falciform appendix with laterally serrate margin ("Endhörnchen" of Verhoeff 1941). Pleopod 2 exopodite pyriform, without sensory spines on lateral margin, endopodite rather slender, distal part broken in examined material.

Uropod. Endopodite inserting slightly proximal of exopodite, protopodite laterally grooved (Fig. 1, Tel).

Genital papilla. No significant features discernible.

Discussion. *Andenoniscus* Verhoeff, 1941 is a genus of rather small species inhabiting mainly the cordilleras of South America. Beside the type species, two species are described from Ecuador, i.e. *Andenoniscus narcissi* Vandel, 1968 and *Andenoniscus tropicalis* Vandel, 1968, both based on only some female specimens. These species have been transferred by Vandel (1972) to the genus *Erophiloscia* Vandel, 1972 accompanied by the statement that the author never had seen a specimen of *Andenoniscus* Verhoeff, 1941, only of *Erophiloscia* Vandel, 1972. Therefore, from his point of view it is not justified to ascribe the above mentioned species to *Andenoniscus* Verhoeff, 1941. The disposition of *tropicalis* Vandel, 1968 and *narcissi* Vandel, 1968 to *Erophiloscia* Vandel, 1972 appears random since the most

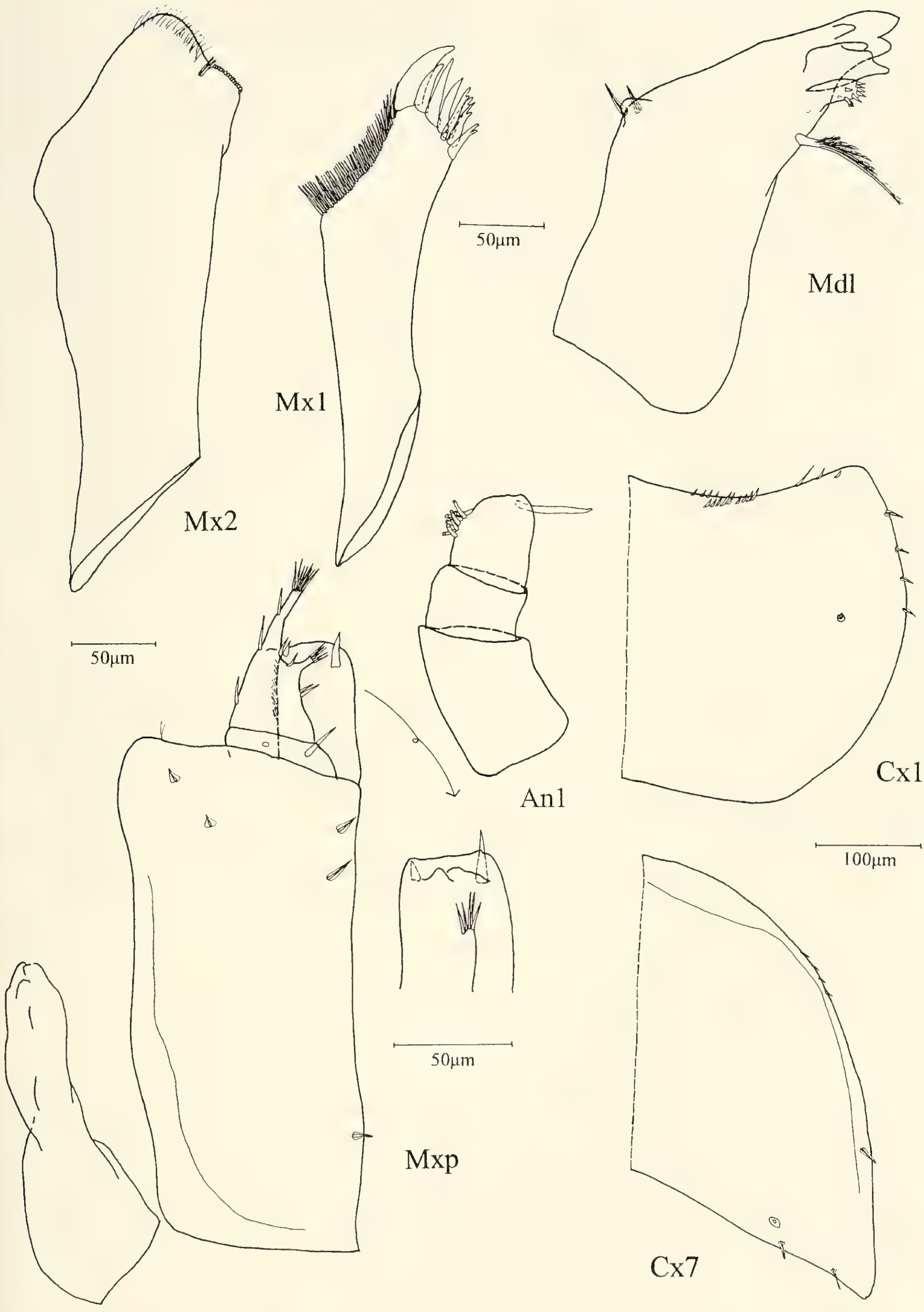

Fig. 1. *Andenoniscus silvaticus* Verhoeff, 1941. **An1:** antennula; **Cx1:** coxal plate 1; **Cx7:** coxal plate 7; **Mdl:** left mandible; **Mxp:** maxilliped with detail of endite, rostral view; **Mx1** maxilla, lateral endite; **Mx2**: maxilla.

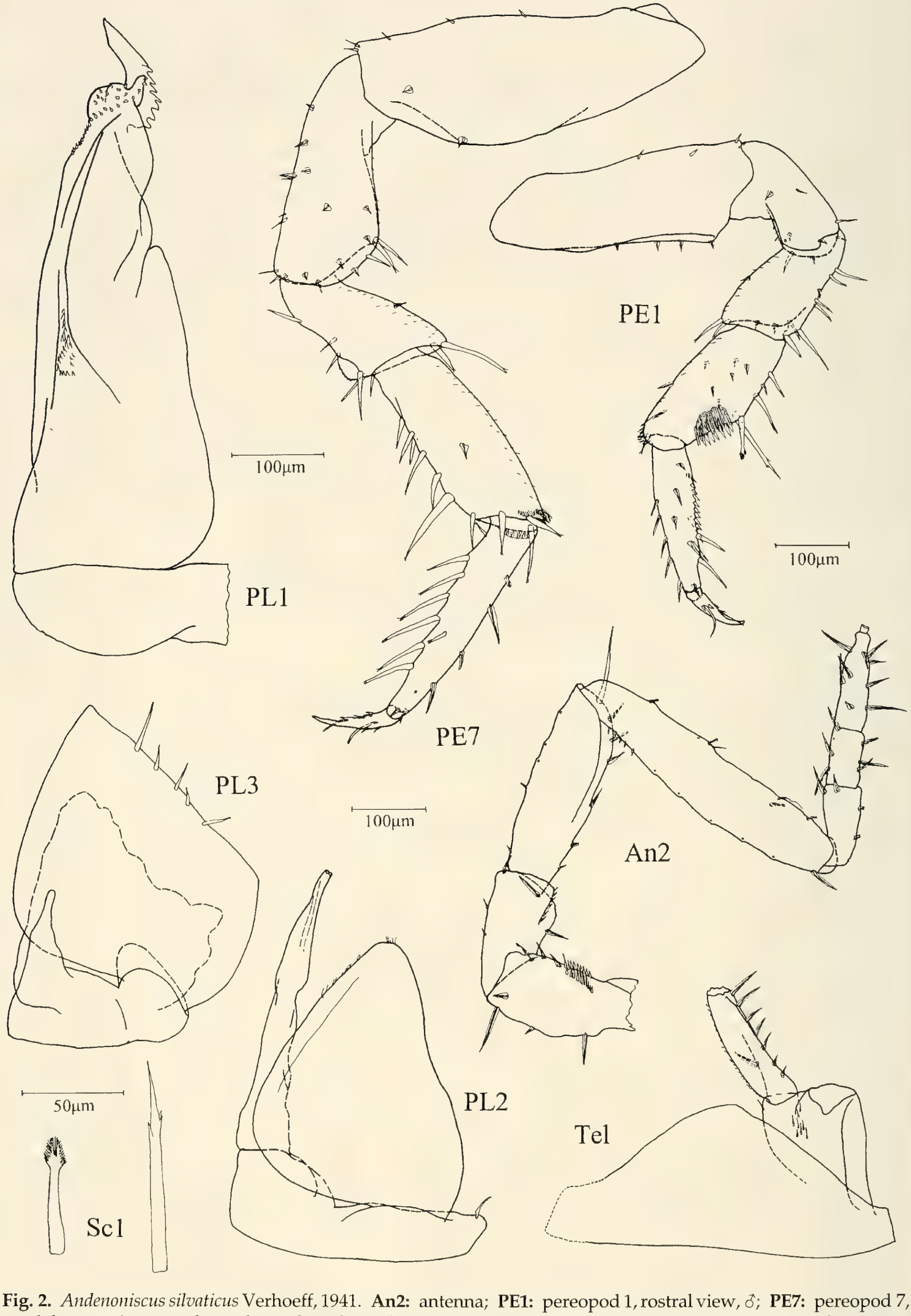

Fig. 2. *Andenoniscus silvaticus* Verhoeff, 1941. **An2:** antenna; **PE1:** pereopod 1, rostral view, ♂; **PE7:** pereopod 7, caudal view, ♂; **PL1:** pleopod 1 endopodtite, ♂; **PL2/3:** pleopods 2 and 3, ♂; **Sc1:** sensory spines of carpus 1; **Tel:** pleotelson with left uropod in situ.

characteristic difference between both genera is the shape of the male pleopod 1 and 2 endopodites which are rather sout in *Andenoniscus* Verhoeff, 1941 but rather slender in *Erophiloscia* Vandel, 1972. Both *tropicalis* Vandel, 1968 and *narcissi* Vandel, 1972 are only known by females, as stated above, so the real affinities will remain obscure. The two *Andenoniscus narcissi* Vandel, 1968 and *Andenoniscus tropicalis* Vandel, 1968 should be treated as nomina dubia since it is difficult even to establish their generic relationships. And it is quite impossible to discriminate the males of these species, if they were ever found.

In the original description of *Andenonsicus silvaticus* Verhoeff, 1941 several individuals are mentioned from two collection sites at Peru, a female from Aina and several specimens from Sivia (Verhoeff 1941). The whereabouts of all the material but the examined male is enigmatic, since it is not deposited in the Naturhistorisches Museum, Hamburg as stated by Verhoeff, nor in the Naturkundemuseum der Humboldtuniversität Berlin, nor in ZSM.

The re-examination of the remaining material should accomplish the generic diagnosis of *Andenoniscus* Verhoeff, 1941. It is quite similar to other small South American crinochete Oniscidea, particularly to *Ecuadoroniscus* Vandel, 1968 and *Erophiloscia* Vandel, 1972 in general appearence, and the shape of the mouthparts, but are at once discriminated by their male pleopod 1 endopodites from *Erophiloscia* Vandel, 1972; *Ecuadoroniscus* Vandel, 1968 is known only from a single female, but differs notably in the shape of the mouthparts. The male pleopod 1 endopodites of *Andenoniscus* Verhoeff, 1968 are of unique complexity within the neotropic philosciid *Oniscidea* save in some members of *Prosekia* Vandel, 1968, where they are structurally quite different to Verhoeff's diagnosis, the lateral endite of the maxillula is composed of 4+4 teeth with the inner set cleft, he may have taken the 8th tooth for a small additional tip of one of the other teeth, since he wrote that only one of the 7 teeth is equipped with a small additional tip.

Genus *Araucoscia* Verhoeff, 1939

Diagnosis. Cephalothorax with linea supra-antennalis, linea frontalis lacking. Antenna with three-articulate flagellum. Mandibles bearing dichotomized molar seta, maxillula with 7 teeth on lateral endite, maxilla with median lobe half as wide as lateral, maxilliped with endite lacking knob-like penicil and setation, strong seta and 2 cusps.

Pereopods slender, dactylus with short inner claw and flagelliform dactylar seta, long medial sensory spines of carpus on prominent humps. Coxal plates rather narrow, without sulcus marginalis and gland pores, two noduli laterales present. Pereopod 7 might be sexually dimorphic with male ischium bearing setal comb rostrally. No respiratory areas discernible on exopodites of pleopods at 400× magnification. Exopodites rounded, with long sensory spines laterally.

Type species. *Araucoscia chilenica* Verhoeff, 1939 (by monotypy and original designation).

Araucoscia chilenica Verhoeff, 1939

Figs 3-6

Material. 3 slides of ♂ (6 mm), ♀ (7mm), the only material available representing this species: Chile, Calbuco, leg. Dr. G. H. Schwabe (10.10.1937) (ZSM), ♂ designated herein **Lectotype**.

Description

Colour. Verhoeff (1939) described the colouration of the living animals as brown with grayish yellow spotting.

Cephalothorax. Linea supra-antennalis present, bent between the antennal sockets, linea frontalis very faint, vertex rather rounded, without setation, compound eyes composed of several ommatidia seemingly randomly arranged.

Pereon. Tegument rather smooth, coxal plates narrow, without sulcus marginalis and gland pores, some tricorn-like setae arranged near lateral margin, two noduli laterales present, insertion on coxal plate 4 as in Fig. 3, Cx4, on coxal plate 7 one near the lateral magin, one near the caudal margin, all broken in the mounted specimens.

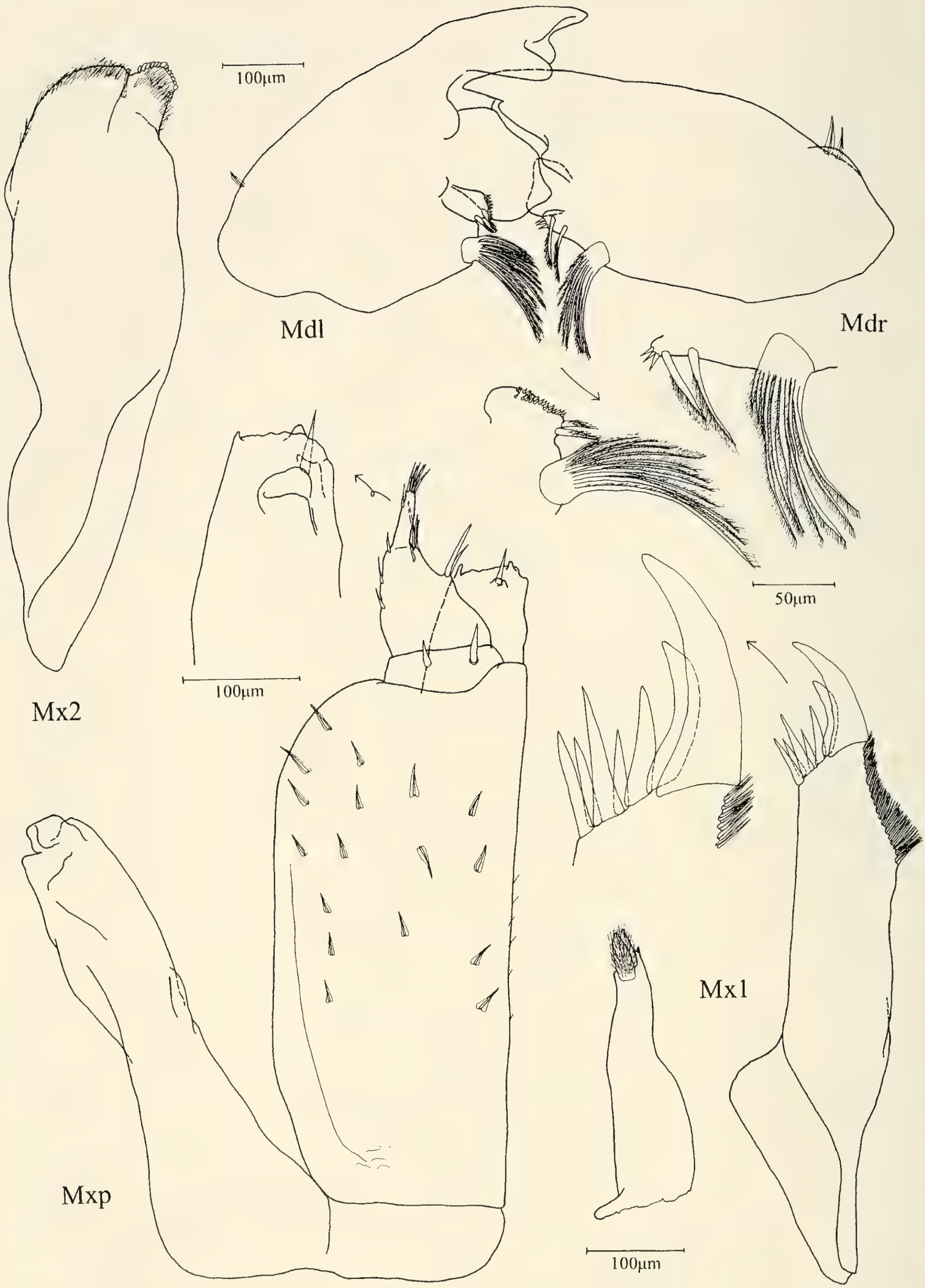

Fig. 3. *Araucoscia chilenica* Verhoeff, 1939. **Mdl:** left mandible in situ with detail of molar penicil, **Mdr:** right mandible in situ with detail of molar penicil; **Mxp:** maxilliped with detail of endite, rostral view; **Mx1:** maxillula with detail of apical region of lateral endite; **Mx2:** maxilla.

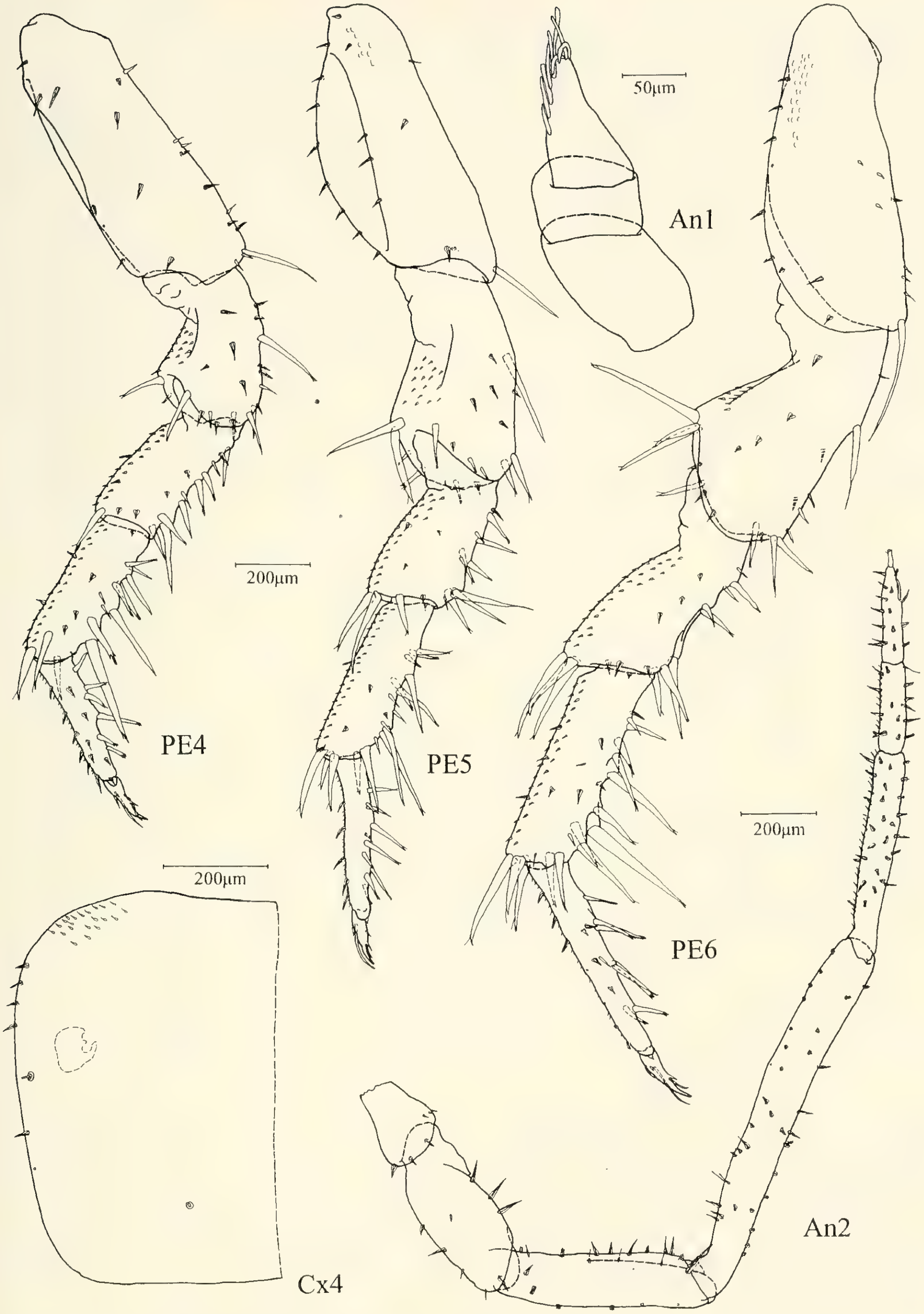

Fig. 4. *Araucoscia chilenica* Verhoeff, 1939. **An:** 1 antennula; **An2:** antenna; **Cx4:** coxal plate 4; **PE4-6:** pereopods 4-6, caudal view, ♀.

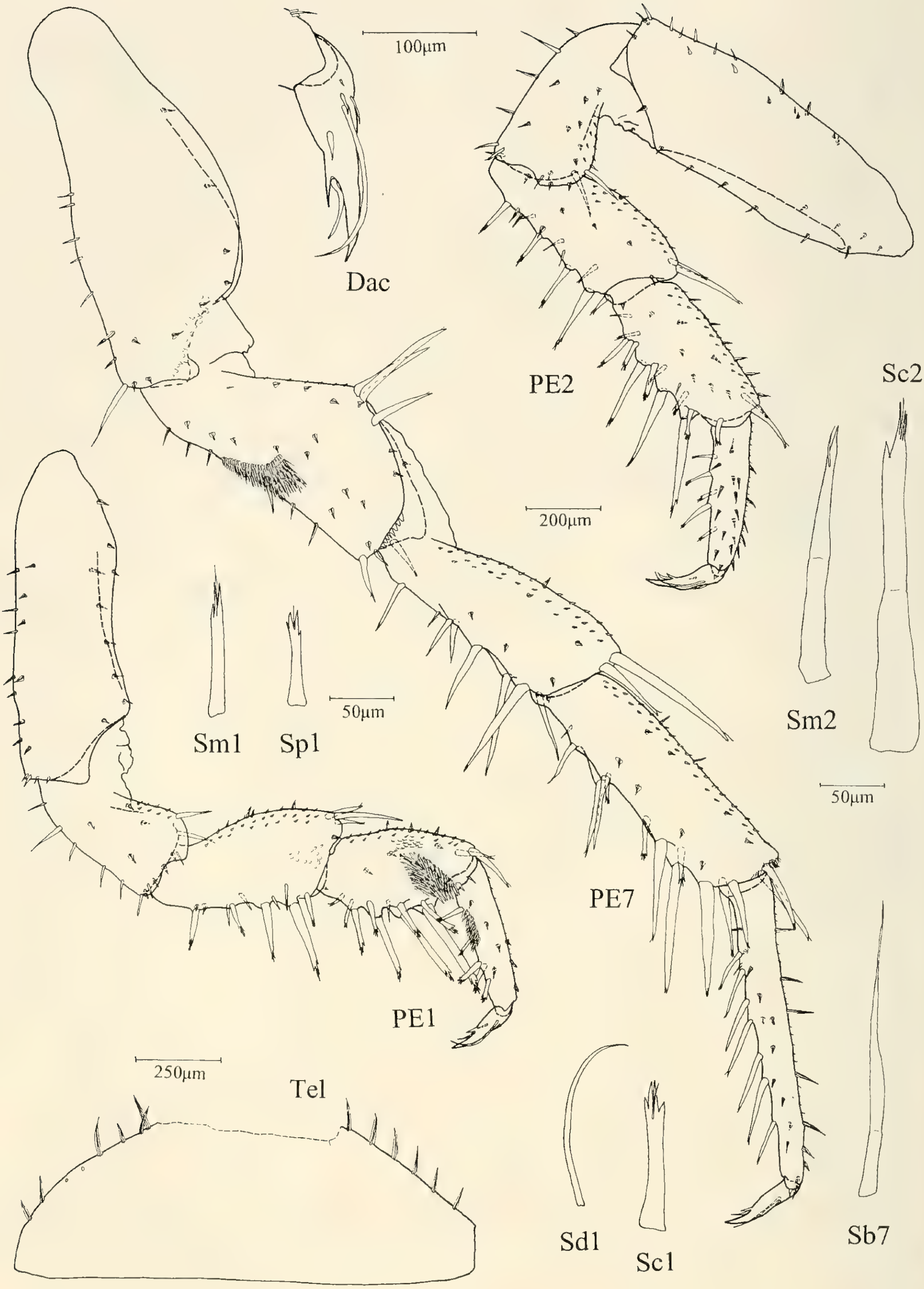

Fig. 5. *Araucoscia chilenica* Verhoeff, 1939. **Dac:** dactylus, rostral view; **PE1:** pereopod 1, rostral view, ♂; **PE2/7:** pereopods 2 and 7, caudal view, ♂; **Sb7:** sensory spine of basis 7; **Sc1:** sensory spine of carpus 1; **Sc2:** sensory spine of carpus 2; **Sd1:** dactylar seta of dactylus 1; **Sm1:** sensory spine of merus 1; **Sm2:** sensory spine of merus 2; **Tel:** proximal half of pleotelson, apex broken.

Pleon. Retracted from pereon, but small neopleurae on pleonites 3 to 5 present. Pleotelson pointed with straight lateral margins, bearing a row of tricorn-like setae, apex in examined type material broken.

Antennula. Three-articulate with article 1 and 3 subequal in length, article 2 of half the length, distal article pointed, bearing a set of aesthetascs (Fig. 4, An1).

Antenna. Flagellum three-jointed, proximal twice as long as article 2 and 3, apical organ broken in examined material. Peduncle with article 5 as long as flagellum, article 4 of half the length, all articles bearing tricorn-like setae (Fig. 4, An2).

Mandible. Since mandibles mounted in situ, examination difficult. Molar penicil prominent, dichotomized, composed of about 10 branches, pars intermedia with coniform setae, only few on right mandible, two penicils present. Additional penicil on left mandible not discernible (Fig. 3, Mdl/Mdr).

Maxillula. Medial endite with two penicils and lateral tip apically, lateral endite with extraordinarily arranged acute teeth, tooth formula described by Verhoeff (1939) as 1+6 (2+1+1+1+1), lateral one huge, endite laterally with fringe of setae, about 3 originating at same level, thus lateral margin appearing serrate (Fig. 3, Mx1).

Maxilla. Medial lobe half as broad as lateral, apically cuspidate, both lobes apically setose (Fig. 3, Mx2).

Maxilliped. Palp three-articulate, article 2 with 4 to 5 setae distally and a long and short seta medially of medial margin, proximal article with tuft of few setae apically, proximal joint with 2 subequal setae. Endite lacking setation and knob-like penicil, apically with 2 cusps and a stong seta, rostral surface with wrinkled protrusion (Fig. 3, Mxp).

Pereopods. Long and slender, pereopods 6 and especially 7 conspicuously longer than pereopod 1. Carpus and propus of pereopod 1 with antenna grooming-brush, sensory spines with fourlobed apices, the longest originating on conspicuous humps on pereopods 1 to 4. Dactylus with short inner claw, flagelliform dactylar seta, interungual seta almost as long as main claw. Pereopod 7 with setal comb on medial margin of ischium conspicuously shaped: proximally small and parallel to margin, more distally bent inwards while broadening. Basis of all pereopods of comparable size (Fig. 4, PE4-6; Fig. 5.Dac, PE1-2, 7).

Sexual differentiation. Micropsopic slides showing male pereopods 1, 2 and 7 while pereopods 4 to 6 are of a female specimen, therefore no statements can be given.

Pleopods. Pleopod exopodites very rounded, lateral margin concave, bearing 3 to 5 sensory spines, endopodites comparably short, lobate. No respiratory areas on exopodites discernible (Fig. 6, PL1-4).

Sexual differentiation. Male pleopod 1 with exopodite triangular, obliquely pointed, laterally with obtuse additional apex, endopodite slender, slightly s-shaped, with longitudinal row of inconspicuous spiniform setae medially, subapically terminated by 7 more prominent setae, apex acute. Pleopod 2 with pointed exopodite, lateral margin sinuous, bearing 3 sensory spines, endopodite basally broader than distal part, tapering at half of length, apex slightly bent medially. Female pleopods 1 and 2 remaining unknown.

Uropod. Verhoeff (1939) mentioned that the exopodites were broken, endopodites inserting proximally of exopodites.

Genital papilla. Ductus ejaculatorii proximally very close, mouths slightly surpassing apex of ventral shield (Fig. 6, Gen).

Discussion. The monotypic genus *Araucoscia* Verhoeff, 1939 from Chile is one of the enigmatic genera from southern South America. It was found on Calbuco Island at 41°6'30"S and 73°8'W which is mainly used for agriculture even in 1937 when *Araucoscia* Verhoeff, 1939 was collected. The genus is characterized by the peculiar dentation of the lateral endite of the maxillula, which is superficially similar to the Melanesian genus *Oroscia* Verhoeff, 1926, which shows a 4+4 pattern instead of a 1+6 pattern of *Araucoscia* Verhoeff, 1939. Interestingly, *Oroscia squamuligera* Verhoeff, 1926 bears a similar ornamental sensory spine on carpus 1 and the longer sensory spines of the medial margin of carpus and merus are raising from a prominent hump. Other genera from the Australian zoogeographic region also have a most lateral tooth of the maxillula of huge dimensions, i.e. *Adeloscia dawsoni* Vandel, 1977 (North Island of New Zealand), *Leucophiloscia endogaea* Vandel, 1973 (Papua-New Guinea) and certain species of *Papuaphiloscia* Vandel, 1970 like *Papuaphiloscia rennelli* Vandel, 1973 (Solomon Islands). They all differ from *Araucoscia chilenica* Verhoeff, 1939 in having the molar penicil simple and – save *Leucophiloscia endogaea* Vandel, 1973 – bearing a knob-like penicil on the endite of the maxilliped. Particularly

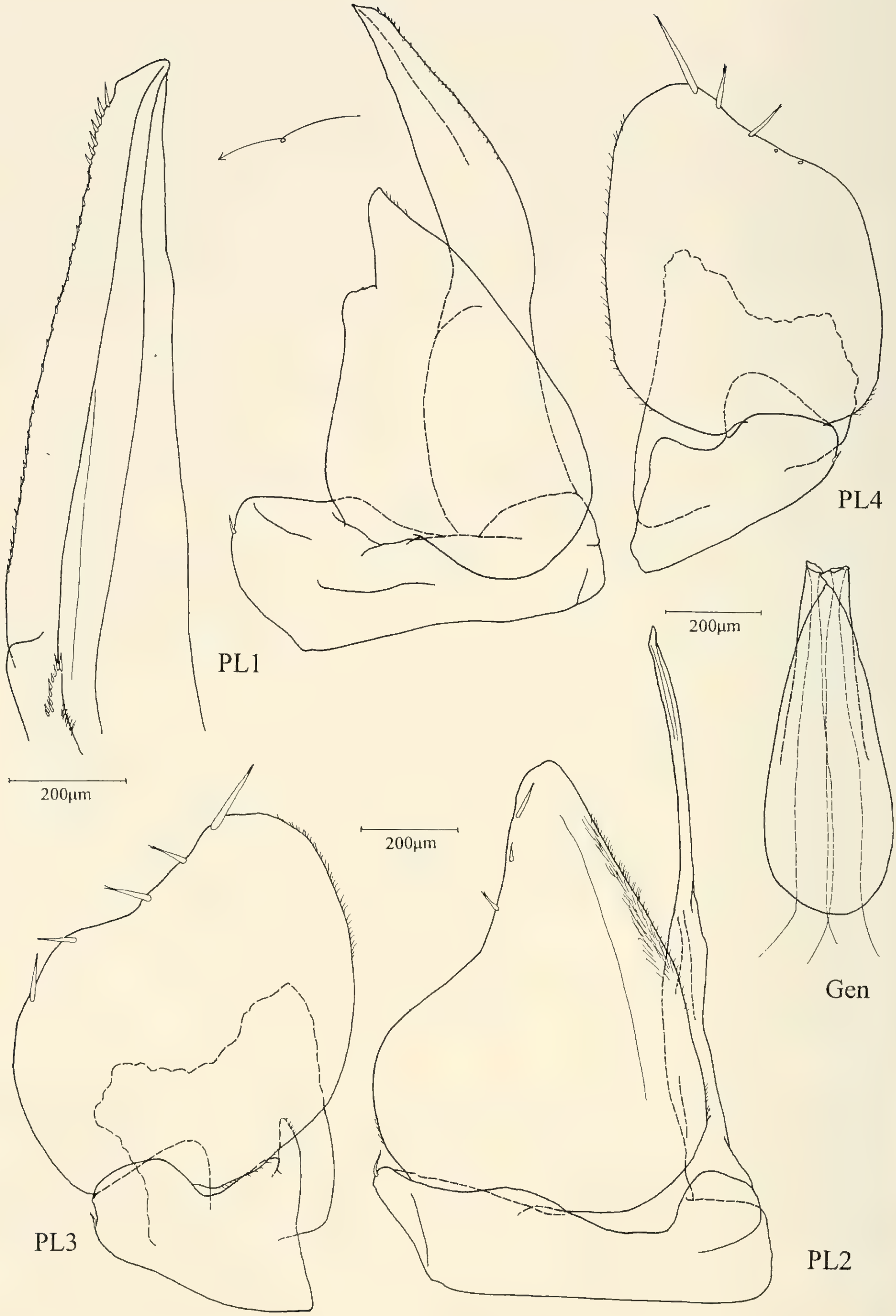

Fig. 6. *Araucoscia chilenica* Verhoeff, 1939. **Gen:** genital papilla; **PL1-4:** pleopods 1-4 with detail of enopodite 1, caudal view.

Adeloscia dawsoni Vandel, 1977 is similar to *Araucoscia chilenica* Verhoeff, 1939 in the shape of the male pleopod 1 with the exopodite simpler, bearing a weak sinuosity instead of an incision laterally.

The shape of the endite of the maxilliped is comparable with the respective appendage of *Andenoniscus* Verhoeff, 1941 and *Oniscophiloscia* Wahrberg, 1922. There is a further similarity between *Araucoscia* Verhoeff, 1939 and *Oniscophiloscia* Wahrberg, 1922: the molar penicil of both genera is rather strong and dichotomized, certainly representing a symplesiomorphy. Therefore, this character is useless for reconstruction of phylogeny.

The pleonites bear only small neopleurae (Verhoeff 1939), while the pereopods 7 are surprisingly long compared with other "philosciid" Oniscidea, so it may be presumed, that *chilenica* Verhoeff, 1939 is capable of quick movements within its habitat. This might be a preadaptation to rather open habitat, which was originally covered with temperate rain forest.

Acknowledgements

The author like to express his thanks to Dr. L. Tiefenbacher, Zoologische Staatssammlung München, for the loan of the material. He is indepted to Dr. Gisela Wegener, Naturkundemuseum Hamburg, and Dr. C. O. Coleman, Museum für Naturkunde Berlin, for their support in tracing the whereabouts of the material.

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30. Endres, K.-P- & W. Schad: Biologie des Mondes - Mondperiodik und Lebensrhythmen. - S. Hirzel Verlag Stuttgart, 1997. 308 S. ISBN 3-7776-0731-2.

Biologie des Mondes - das klingt spannend. Den Autoren Klaus-Peter Endres und Wolfgang Schad gelingt es auch meist, die Wechselbeziehungen von Mond und Lebewesen kurzweilig und lebhaft darzustellen. So erfährt der Leser in der Einführung allerhand Interessantes über das mondperiodische Verhalten von Diademseeigel, Palolowurm und Aal. Es folgen die Kapitel “Kleine Mond- und Gezeitenkunde”, die in verständlicher Sprache Mondphasen, Gravitationskräfte, Ebbe und Flut erklären. Die folgenden circa 70 Seiten befassen sich dann ausführlich mit dem Einfluß des Mondes auf eine Reihe exemplarisch ausgewählter Organismen. Der sich über 85 Seiten erstreckende Artenkatalog benennt die Kurzcharakteristiken der Mondrhythmen von rund 600 systematischen Gruppen aus dem Pflanzen und Tierreich. M. Schmelzle

31. Kleukers, R., E. Van Nieukerken, B. Odé, L. Willemse & W. Van Wingerden: De sprinkhanen en krekels van Nederland (Orthoptera). – Nederlandse Fauna I. Nationaal Natuurhistorisch Museum, KNNV Uitgeverij & EIS-Nederland, Leiden, 1997. 416 blz., 16 platen. ISBN 90-73239-51-6 (dit boek, NNM), ISBN 90-5011-100-9 (dit boek, KNNV).

Das Buch ist ein umfassendes Werk über die Heuschreckenfauna der Niederlande incl. einer CD mit den Gesängen aller 45 in den Niederlanden vorkommenden Arten. Es faßt das Ergebnis einer mehrjährigen Kartierungsarbeit zur Erfassung der niederländischen Saltatoria zusammen. Daneben enthält es Kapitel zur Geschichte der Orthopterenforschung, zur Systematik und Nomenklatur, zur Biologie der Heuschrecken allgemein, zu Gesang, Ökologie und Verbreitungsdynamik in den Niederlanden. Kernstück des Buches ist das umfangreiche Kapitel mit detaillierten Angaben zu den einzelnen Arten (Morphologie, Biologie, Gesang, Identifikation, Verbreitung in den Niederlanden und in Europa, usw.), in das auch viele Erkenntnisse aus der Literatur eingearbeitet sind. Außerdem gibt es zur Identifizierung der Spezies einen äußerst nützlichen Schlüssel mit vielen sehr übersichtlichen Skizzen und Fotos. Eine gute Ergänzung dazu ist die CD, mit meist mehreren Gesangsvarianten einer Art und allen dafür wissenswerten Angaben, unter denen die Aufnahmen zustande kamen. Es wäre jedoch noch hilfreicher, wenn auch die Namen der jeweiligen Art auf dem Tonträger erwähnt würden, um ständige Vergleiche der Beilage mit dem Display des Recorders zu ersparen. Das Buch bietet darüber hinaus Informationen zur Kartierung sowie zu Schutz- und Pflegemaßnahmen, um den Lebensraum der Heuschrecken zu erhalten bzw. zu verbessern. Durch seine Aufmachung hat das Werk gleichermaßen für die Fachwelt, wie auch für interessierte Laien viel zu bieten. Ein sehr schönes, preiswertes Buch, das durch eine Übersetzung ins Englische einem noch größerem Publikum zugänglich gemacht werden sollte.

M. Breitsameter

32. Merrit, R., N. W. Moore & B.C. Eversham: Atlas of the dragonflies of Britain and Ireland, ITE research publication no.9. – Centre for Ecology and Hydrology, London HMSO, 1996, 149 S. ISBN 0-11-701561-X.

Großbritannien und Irland gehören faunistisch auch in der Entomologie sicher zu den bestbearbeiteten Gebieten der Welt. Der vorgelegte Verbreitungsatlas der Libellen in diesem Raum zeigt auch die Fülle von Daten und vor allem zahlreicher Personen, die diese zusammengetragen haben. Alle bodenständigen und einwandernden Libellenarten sind aufgeführt mit einer detaillierten Punktverbreitung. Ein Einblick und den derzeitigen Bestand und dessen Wandel in der Vergangeheit wird ebenso vermittelt wie eine Beschreibung zur Biologie der Arten. Moderne Verfahren und Auswertungen von Libellenbeobachtungen werden vorgestellt, die sicher beispielgebend sind. Am Ende sind die Flugzeitentabellen zusammengefaßt. Den Abschluß bilden Hinweise zum Schutz, der sich vor allem auf den Schutz der Lebensräume dieser auffälligen merolimnischen Insekten konzentrieren muß. E.-G. Burmeister

SPIXIANA	**21**	3	227	München, 01. November 1998	ISSN 0341-8391

Hadroocorys dorae Kreipl & Mühlhäusser, 1996 is a *Semicassis*

(Mollusca, Gastropoda, Cassidae)

Kurt Kreipl

Kreipl, K. (1998): *Hadroocorys dorae* Kreipl & Mühlhäusser, 1996 is a *Semicassis*. – Spixiana **21/3:** 227

The new Cassid species described by Kreipl & Mühlhäusser as *Hadroocorys dorae* in Spixiana 19(3) pp. 305-306, 1996 is placed in the genus *Semicassis* Mörch, 1852.

Kurt Kreipl, Höhenweg 6, D-74613 Öhringen-Cappel, Germany.

As there is now more and better preserved material for study available the species which we described as *Hadroocorys dorae* from northern Sri Lanka must be placed in the genus *Semicassis* Mörch, 1852. The new material shows a distinct siphonal canal, a feature which is not present in the genus *Hadroocorys* Quinn, 1980. In the holotype (ZSM, Eing. Kat. Nr. 1996 483) and the paratypes the siphonal canals were broken and therefore not visible.

One specimen in collection Kreipl shows a very indistinct pattern of pale yellowish, squarish spots. The two known species of *Hadroocorys H. verrilli* (Dall 1889) and *H. tosaensis* (Habe & Azuma 1959) don't have any traces of a pattern.

Therefore we consider *dorae* an extremely thick-shelled species of the genus *Semicassis*.

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Habe, T. 1964. Shells of the Western Pacific in Color **2**: 67

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Kreipl, K. 1996. Recent Cassidae

Quinn, J.F. jr. 1980. A new genus, species and subspecies of Oocorythidae (Gastropoda: Tonnacea) from the Western Atlantic. – The Nautilus **94(4)**: 149-157

Turner, R.D. 1948. The family Tonnidae in the Western Atlantic. – Johnsonia **2(26)**: 165-191

33. Martens, A.: Die Federlibellen Europas. – Die Neue Brehm Bücherei 626, Magdeburg, 1996, 149 S. ISBN 3-89432-458-9.

Libellen, diese fluggewandten Luftjäger, gehören inzwischen zu den bestbekannten Insektengruppen in Europa. Die Federlibellen, deren Name von den verbreiterten Mittel – und Hinterschienen der Beine herrührt, sind in Europa nur mit 4 Arten vertreten. Im vorliegenden Bändchen werden jedoch auch die östlich angrenzenden Areale mitberücksichtigt. Die heimische *Platycnemis pennipes* und ihre Verwandten besiedeln vorzugsweise das Einzugsgebiet von Flüssen, sie als Bioindikator zu bezeichnen scheint allerdings vermessen. Der Autor, der sich umfassend mit der Biologie dieser Tiere sowohl der Larven wie Imagines befaßt, hat hier ein sehr komplexes Gesamtbild erstellt, in dem die Systematik, die Bestimmungskriterien beider Stadien, die Biologie mit Fortpflanzungsverhalten, Larvalentwicklung, Habitatwahl und die Verbreitung spez. von *Platycnemis pennipes* besondere Beachtung finden (Teil II). Bei der Darstellung der anderen Arten, deren Biologie sicher weniger gut bekannt ist (Teil I), wird auf deren Verbreitung besonders ausführlich eingegangen. Insgesamt ist dies eine gelungene Zusammenfassung aller bisher bekannten Beobachtungen zur Lebensweise und Habitatbeanspruchung dieser auffälligen und häufig zu beobachtenden Libellengruppe. E.-G. Burmeister

34. Forschungsgruppe Fließgewässer: Fließgewässertypologie – Ergebnisse interdisziplinärer Studien an naturnahen Fließgewässern und Auen in Baden-Württemberg mit Schwerpunkt Buntsandstein-Odenwald und Oberrheinebene. – Umweltforschung in Baden-Württember, ecomed Landsberg, 1994, 226 S. ISBN 3-609-65860-6.

Namhafte Institutionen und Personen, die mit der Fließgewässerproblematik im Bundesland Baden-Württemberg betraut sind, haben hier in einem Bericht die letztjährigen Forschungsergebnisse einer Audtragsstudie zusammengestellt. Da bisherige vergleichbare Projekte fehlten, die Gewässerproblematik jedoch zunehmend an Bedeutung gewinnt, soll diese Pilotcharakter besitzen. Die genaueren Kenntnisse, die bisher noch weitgehend fehlen, sind jedoch wesentlich für die Planung und die Entwicklung von Leitbildern sowie der ökologischen Bewertung. Das Ziel, natürliche Gewässerzustände als Vergleichsbasis und Bewertungsgrundlage heranzuziehen, unter der Vorgabe die des Odenwaldes und der Rheinebene seien natürlich, erscheint allerdings vermessen. Ein ausgesprochenes Ziel ist auch, die Vielfalt der unterschiedlichen Fließgewässer interdisziplinär zu strukturieren und eine Typologie aufzustellen, was meist der Individualität, d.h. dem jeweiligen Charakter nicht gerecht werden kann. Der Versuch ist sicher eine interessante Zusammenstellung verschiedener Bearbeitungsaspekte, bietet allerdings kein Rezept für die Bewertung. Hinweise auf Leitbilder, denen Indikatorfunktion zugesprochen wird, lassen einen Umkehrschluß nicht zu, nämlich an Hand der Leitbilder ein Gewässer zu beschreiben! Bedauerlicherweise kommt die Biologie der Organismen zu kurz. Diese wird ein Planungskonzept gepreßt ebenso wie die "naturnahe Gewässerentwicklung", die sich ausschließlich an einem bestimmten Zweck orientiert. Alle Planungsvorgaben infolge der Gewässeraufnahme haben bedauerlicherweise Fehler bisher nicht ausschließen können. E.-G. Burmeister

35. Weller, F., Durwen, K.-J.: Standort und Landschaftsplanung – Ökologische Standortkarten als Grundlage der Landschaftsplanung. – Umweltforschung in Baden-Württemberg, ecomed Landsber, 1994, 170 S. ISBN 3-609-65430-9.

Die Anregung zu dem vorliegenden Band ergab sich durch ein vom Land Baden-Württemberg initiiertes Projekt "Angewandte Ökologie". Hier wird die Verknüpfung ökologischer Standortkartierungen mit moderner Datenverarbeitung und weiterführenden Möglichkeiten aufgezeigt. Das Inhaltsverzeichnis liest sich wie die Anleitung zu einer Modellstudie mit Ausführungsvorschrift einer Landschaft auf dem Reißbrett. Neben den Verfahren der Standortkartierung, die ausschließlich abiotisch vorgeht, wird der Aufbau eines landschaftsökologischen Informations-Systems und eine "Erste beispielhafte Systemanwendung" vorgestellt. Aus diesen wird eine Ableitung ökologisch fundierter Leitbilder auf mageren 12 Seiten vorgestellt. Spätestens hier wird beim Studium sichtbar, daß die biotischen Verhältnisse und Zusammenhänge der Landschaft, die aus Teilökosystemen zusammengesetzt ist, völlig fremd und auch offensichtlich gleichgültig sind. Es bleibt dringlichst zu hoffen, daß derartige "Grundlagen für die Landschaftsplanung" nie in die Praxis umgesetzt werden, da dann auch naturnahe Bereiche betroffen wären. Der Titel verrät nicht die Konzeption dieser Zusammenstellung, nämlich die einer agrarökologischen Gliederung. E.-G. Burmeister

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The larva of *Lype auripilis* McLachlan, 1884

(Insecta, Trichoptera, Psychomyiidae)

Rufino Vieira-Lanero, Marcos A. González and **Fernando Cobo**

Vieira-Lanero, R., M. A. González & F. Cobo (1998): The larva of *Lype auripilis* McLachlan, 1884 (Insecta, Trichoptera, Psychomyiidae). – Spixiana **21/3:** 229-234

The larva of *Lype auripilis* McLachlan, 1884, is described for the first time and the most important diagnostic features are illustrated. The colour pattern of the head is the chief character for a clear differentiation from the remainder Iberian species of the genus. Some zoogeographical and ecological notes are included.

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Introduction

Larvae of *Lype* species construct galleries on submerged wood in streams, rivers, ponds and lakes. Larvae of the genus *Lype* can be separated from other European *Psychomyiinae* – *Psychomyia* Latreille, 1829 and *Tinodes* Leach, 1815 (*Metalype* Klapalek, 1898 being synonymized with *Psychomyia* by Malicky, 1995) – using the key of Edington & Hildrew (1995) by the following combination of morphological features: pronotum without black thickening in posterior-lateral position and anterior part of coxopleurite of first leg with only one vertical black bar.

According to the inventary given by González et al. (1992), the genus *Lype* McLachlan, 1878, is at present represented in the Iberian Peninsula by three species: *L. phaeopa* (Stephens, 1836), known from Europe and Iran, *L. reducta* (Hagen, 1868), a species widely distributed throughout Europe, North of Africa and SW Asia and *L. auripilis* McLachlan, 1884, a species only known from SW Europe. Within this group, *L. auripilis* is the only which was hitherto unknown in the larval stage, whereas a number of descriptions are available for the other two species (e.g. Hickin 1967, Edington & Alderson 1973, Edington & Hildrew 1995, Waringer & Graf 1997). Recently, some data on larval distribution and habitat of *L. phaeopa* and *L. reducta* are presented by Wiberg-Larsen (1995).

In recent years, larvae and pupae of *Lype* spp. have been collected from streams in the northwestern quarter of the Iberian Peninsula. Larval exuviae of *Lype auripilis* were obtained from larvae reared in the laboratory to the adult stage and from mature pupae with distinct genitalia collected in several field samples, thereby ensuring the association between larval and adult specimens. In this paper we are going to describe the final instar larvae of this species. Setal nomenclature and terminology follows Wallace et al. (1990) and Williams & Wiggins (1981).

Description of the final instar larva

Material examined: 23 fifth instar larval exuviae of 8♂♂ and 15♀♀ of laboratory reared pupae and 258 larvae of fifth and previous instars. All from Galicia, NW of Spain.

Description

Body length. Up to 11 mm.

Head capsule (Figs 1, 2). Subsquare, slightly longer than wide; length 0.71-0.91 mm (mean 0.81 mm, N = 12), width 0.57-0.77 mm (mean 0.68 mm, N = 12). Head with a broad, dark band which runs transversely across the dorsal surface; large muscle attachment spots on dark areas of genae. Area lateral to the anterior branches of the frontal sutures, periocular area and anterior area of frontoclypeal apotome light yellow; central part dark brown, area near occipital foramen light yellow. Posterior part of frontoclypeal apotome (Figs 2, 7) with a characteristic dark horseshoe-shaped area and a transverse row of 3 large light muscle attachment spots. Transverse band separated from the adjacent dark area of the frontoclypeal apotome by a thin, V-shaped, light yellow area. Ventral surface of the head capsule (Fig. 1) light yellow with a thin, irregular, darker area alongside the ventral ecdysial line; the spots on the ventral surface are almost indistinct. Seta 18 present. Labrum broad and short (Fig. 6); anterior margin membranous, almost straight, with short hairs laterally and even shorter frontally, with 6 pairs of setae and 1 unpaired and 2 pairs of setal pits.

Anterior ventral apotome V-shaped (Fig. 1), arms extended; posterior ventral apotome absent. Paired submental sclerites subrectangular, separate, bearing 1 seta each.

Mandibles (Fig. 8). Approximately as long as they are wide, upper blade of left mandible with a large tooth in addition to the apical tooth; projecting part of the lower blade with 3 short teeth, the further back blunt; there are two setal brushes of indented setae on the inner edge, the further back with finer setae than the anterior one. A little area over the dorsal side of each mandible with small comb-like spines. Apex of right mandible with 2 large teeth on the upper and lower blades; lower blade with 1 additional, indistinct blunt tooth.

Pronotum. Black, greyish brown, slightly broader than head, with a light stripe along the anterior and lateral margins (Fig. 4). Each half of sclerite subsquare in dorsal view (Fig. 3), with four pale spots around base of setae: 2 median spots situated one slightly anterior to the other, and 2 lateral spots fused with the lateral stripe. Muscle attachment spots distinct. Median suture sinuous.

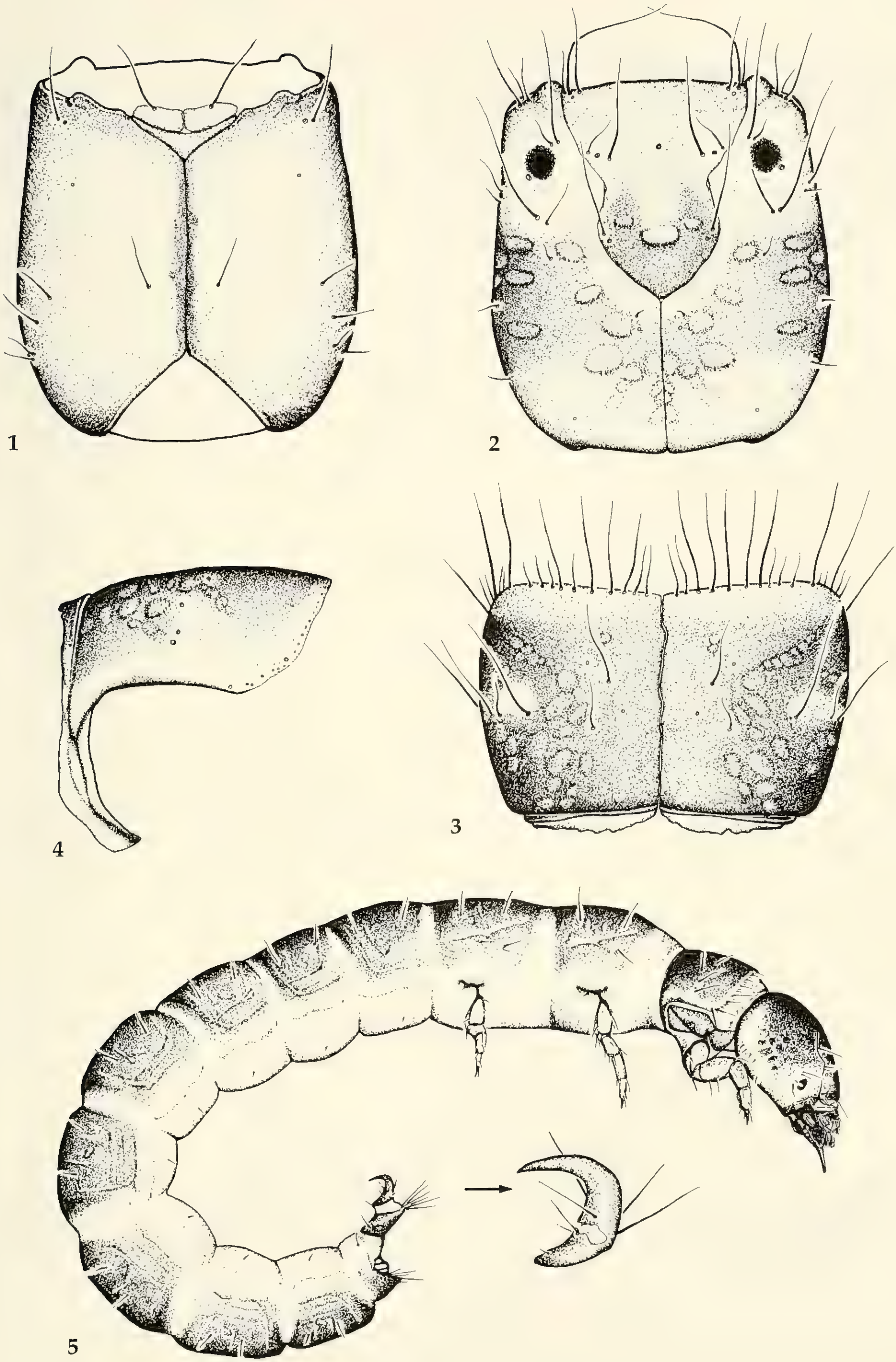
Meso- and metathorax. Membranous, broader than prothorax, with 3 groups of dorsal setae each: 1 seta at *sa*1, 3 setae at *sa*2, and 3 at *sa*3. Meso and metathorax and abdominal segments with broad dark band running longitudinally along dorsum (Fig. 5).

Propleuron (Fig. 5). With a single upward projecting black bar dorsal to the notch which bears the head of the coxa; thus, trochantin of the prothorax is separated from the propleuron by a single, well-marked suture. Meso and metapleura each a narrow sclerotized band (Fig. 10); with one seta in adjacent area.

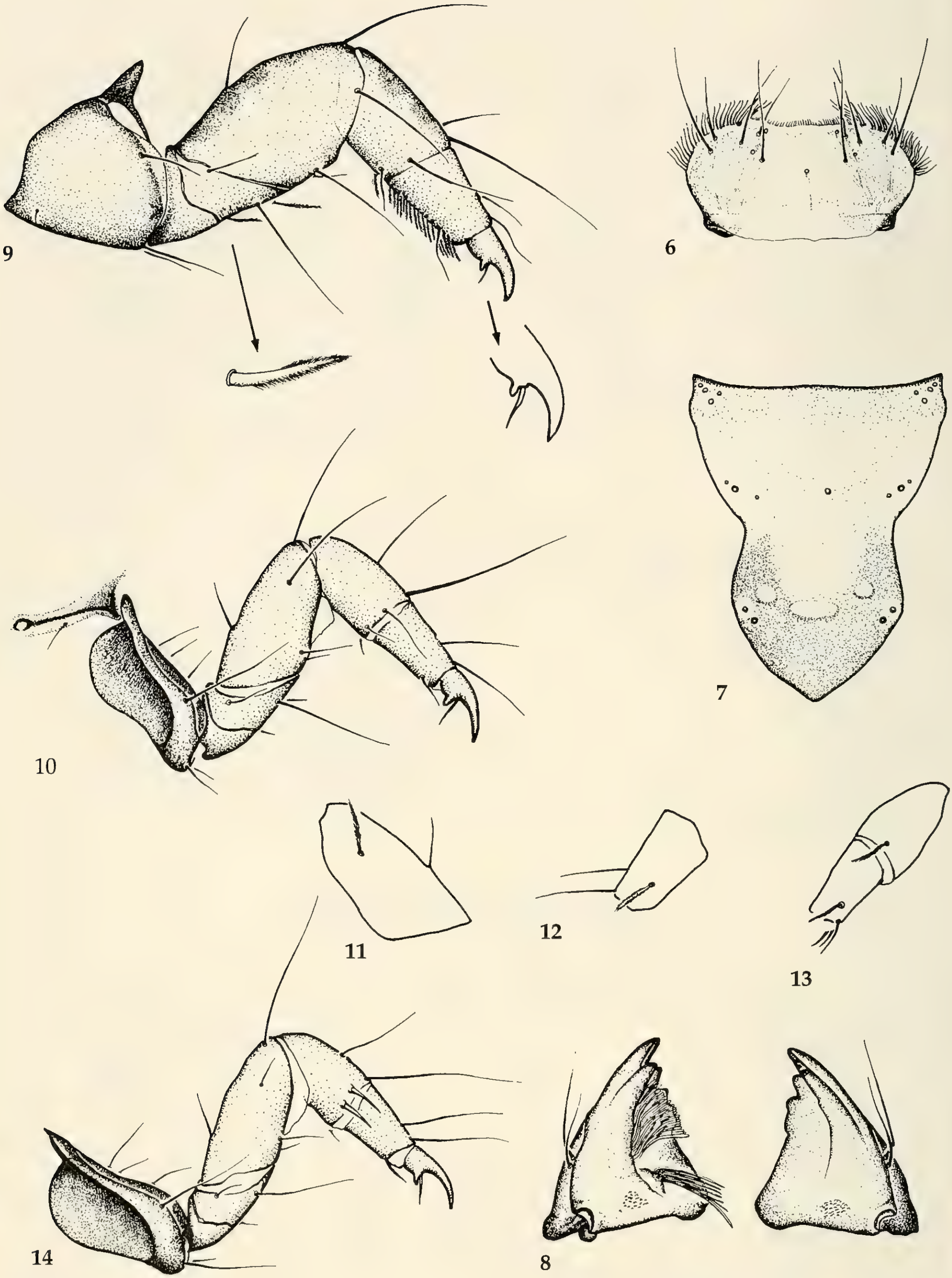
Legs (Figs 9-14). Prothoracic legs concolorous with the pronotum, meso- and metathoracic legs lighter; only prothoracic legs with distinct muscle attachment spots; tarsal claws (Fig. 9, detail) of all legs with a single seta arising from a stout basal process. Prothoracic legs (Fig. 9) slightly longer and stouter than those of other segments, bearing dense brush along mesal margin of tarsus; inner side of trochanter, femur and tibia with 2, 1 and 1 feathered setae (Fig. 9, detail) respectively; tarsal segment without spurs, a feathered seta on distoventral edge. Meso- and metathoracic legs with three tarsal spurs. Mesothoracic legs with 1 feathered seta on inner side of both tibia (Fig. 11) and tarsus (Fig. 12). Outer side of metathoracic tibia (Fig. 14) with two spiny setae and inner side of coxa; trochanter, femur and tarsus with one feathered seta in addition (Fig. 13).

Abdomen. Dorsoventrally flattened, gills and lateral fringe absent; 5 anal papillae present, palmately arranged when extended. Abdominal segments I-VIII of similar length (Fig. 5); segments I-VII uniformly broad; segment VIII slightly narrower, convex posteriorly in dorsal view; segment IX the narrower. Segments I-VIII each bearing 2 pairs of setae dorsally, 1 pair laterally and 1 pair ventrally. Segment IX with a row of 4 long setae dorsally and two shorter in addition arising between the inner and the outer ones; a pair of lateral setae and two ventral setae.

Sclerite of anal proleg. Light brown; a row of distinct muscle attachment spots along the surface; anal claw (Fig. 5, detail) strongly hooked; no ventral teeth on claw.



Figs 1-5. *Lype auripilis*; last instar larva. **1.** Head, ventral view. **2.** Head, dorsal view. **3.** Pronotum, dorsal view. **4.** Pronotum, lateral view. **5.** Larva, habitus lateral and detail of right anal claw.



Figs 6-14. *Lype auripilis*; last instar larva. **6.** Labrum, dorsal view. **7.** Frontoclypeal apotome, dorsal view. **8.** Mandibles, dorsal view. **9.** Prothoracic leg, posterior face, and detail of tarsal claw and the proximal feathered seta of the inner face of trochanter. **10.** Mesothoracic leg, posterior face. **11.** Mesothoracic tibia, feathered seta of the inner side. **12.** Mesothoracic tarsus, feathered seta of the inner side. **13.** Metathoracic tibia and tarsus, feathered setae of the inner side. **14.** Metathoracic leg, posterior face.

Discussion

The larvae of three Iberian species, *L. auripilis*, *L. phaeopa* and *L. reducta* have been examined. In our material – which includes larvae of *L. reducta* and *L. phaeopa* from several European countries (Spain, Poland, Denmark, England, Austria) – we found that the most useful character for the recognition of *Lype* species is the colour pattern of the head, especially the colour pattern of the frontoclypeal apotome. The band of pigment across the dorsal side of the head is darker in *L. reducta* (cf. Moretti 1983, fig. 23 S, Edington & Hildrew 1995, fig. 89, Waringer & Graf 1997, figs 5 and 6, pg. 119) and *L. auripilis* and consequently divides the frontoclypeal apotome into posterior dark and anterior light zones. By contrast, no such clear division is apparent in the *L. phaeopa* we have examined (cf. Moretti 1983, fig. 23 Q, Edington & Hildrew 1995, fig. 90) and in most specimens the frontoclypeal apotome is virtually uniform in colour (cf. Waringer & Graf 1997, fig. 7, pg. 119).

The separation of *L. auripilis* and *L. reducta* can be made by examining the dark area of the frontoclypeal apotome. This dark area in *L. reducta* is in the form of a small regular triangle whereas in *L. auripilis* it is horseshoe-shaped, with two lateral branches projected anteriorly. Another character is concerned with the colour of the pronotal lateral margins. In *L. auripilis* are lighter and fused with the two pale areas in the base of the lateral setae. In addition in *L. auripilis* the ventral surface of the head capsule (Fig. 1) is light yellow with a thin, irregular, darker area alongside the ventral ecdysial line (usually less well defined in *L. phaeopa* and *L. reducta)* and the spots are almost indistinct.

Habitat and distribution

L. auripilis constructs galleries up to 50 mm long on submerged wood debris (branches, logs) in calm and shallow areas of streams and rivers. The walls of the galleries are built of wood fragments and sand grains held together with silk. If pieces of rotting board are available, the larvae congregate on these, channelling in the softer spring wood leaving the more resistant summer wood to form the sides of the shelter.

In the Iberian Peninsula *L. auripilis* has been reported only from low and midland rivers and streams (10-600 m a.s.l.) of the western half (González 1988, González et al. 1992, Terra 1994). *L. auripilis* is the most abundant species of this genus in Galicia, whereas only some isolated individuals of *L. phaeopa* have been caught in the same area, all of them from large lowland rivers. Within this area, *L. reducta* has been reported only from Sierra do Caurel (Lugo). Adults have been collected from March to October (Terra 1981, González 1988)

Acknowledgements

The authors are very grateful to Dr. P. Wiberg-Larsen, Dr. J. Waringer and Dr. S. Czachorowski for both providing larvae of *L. reducta* and *L. phaeopa*. We are specially grateful to Dr. P. Wiberg-Larsen for his critical reading of this manuscript.

This research was supported by XUGA 20001A96 of Xunta de Galicia.

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SPIXIANA	21	3	235–240	München, 01. November 1998	ISSN 0341-8391

Two new species of *Minuthodes* Andrewes from New Guinea

(Insecta, Coleoptera, Carabidae, Lebiinae)

Martin Baehr

Baehr, M. (1998): Two new species of *Minuthodes* Andrewes from New Guinea (Insecta, Coleoptera, Carabidae, Lebiinae). – Spixiana **21/3:** 235-240

Minuthodes multisetosa, spec. nov. and *M. biplagiata*, spec. nov. are newly described from the mainland of New Guinea and Salawati Island, respectively. They are closely related to the *regularis*-group (sensu Darlington 1968) within the New Guinean *Minuthodes*, though *M. multisetosa* is outstanding in having several anterior marginal setae on the pronotum and rows of elongate setae on the 3rd, 5th, and 7th intervals of the elytra. A partly revised key to the New Guinean species is provided.

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Introduction

Minuthodes Andrewes is a moderately speciose genus of lebiine carabid beetles recognized by their conspicuously broad, depressed shape, in particular by their extremely wide pronotum. The genus extends from the Moluccas through New Guinea, New Britain to northern Australia (Darlington 1968, Baehr 1990, 1994), but it is most numerous in New Guinea, from where so far 9 species and one additional subspecies were described. The specific status of one of the New Guinean species, however, is somewhat doubtful (*M. irregularis* Darlington) and it is likely to be only a variation of the more widely distributed *M. regularis* Darlington.

The species occurring in New Guinea, New Britain, and the Moluccas are reported to live mainly in rain forest at or under bark of standing tree trunks and fallen logs (Darlington 1968, A. Riedel, pers. comm.), as do some of the northern Australian species. In Australia, however, certain species regularly occur under the bark of various eucalypts in open sclerophyll forest or woodland (Baehr 1990, 1994), and those species apparently avoid the rain forest. However, this mode of life is probably a secondary ecological shift, and it is only known from Australian species.

During his various trips to different parts of New Guinea (though mainly to Irian Jaya) Mr. A. Riedel (München) collected a fine sample of *Minuthodes* specimens that, inter alia, includes representatives of two conspicuous new species to be described below, both from extreme western Irian Jaya. Additional *Minuthodes* material available to me was collected by W. Ullrich in Papua New Guinea during 1979-1980 and was kindly sent for identification by Dr. I. Löbl from the Muséum d'histoire naturelle, Genève. Some *Minuthodes* specimens were recently (1996) collected by P. Schüle and P. Stüben (Düsseldorf) in mainland Irian Jaya and on Japen Island and they are stored in the Zoologische Staatssammlung, München. In the material collected about 25 years ago by Dr. R. W. Hornabrook (Wellington, New Zealand) in Papua New Guinea and recently sent for identification, an aditional specimen of one of the new species was also included alongside with some specimens of described species.

Measurements

Measurements have been made under a stereo microscope by use of an ocular micrometer. Length has been measured from apex of labrum to apex of elytra. Length of pronotum was taken along midline. Measurements, therefore, may slightly differ from that of other authors, especially Darlington.

Abbreviations of collections mentioned in text

CBM	working collection M. Baehr, München
CBM-ZSM	Zoologische Staatssammlung, München, as permanent loan in the working collection of author
MNZ	Museum of New Zealand, Wellington

Minuthodes biplagiata, spec. nov.

Fig. 1

Types. Holotype: ♀, Irian Jaya, Sorong-Pr. Salawati Isl., Kalobo, 10-130 m, 19.-22.X.1996, leg. A. Riedel (ZSM-CBM).

Diagnosis. Easily distinguished by the bimaculate elytral pattern consisting of circular humeral spots only, and by the almost complete absence of elytral striae.

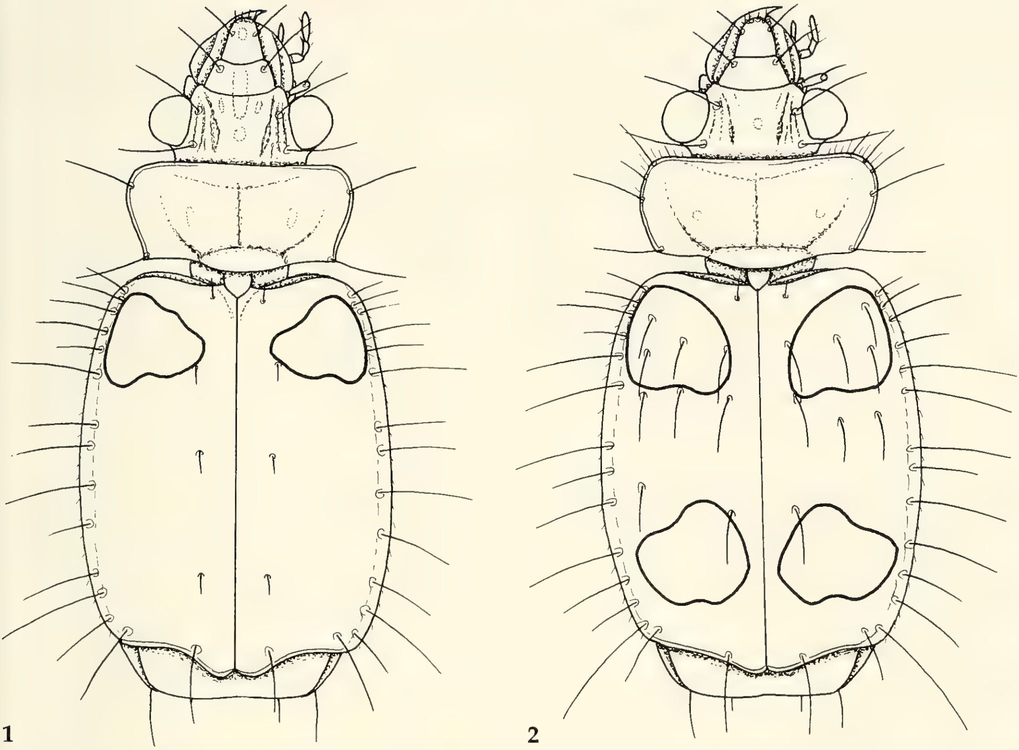
Description

Measurements. Length: 5.2 mm; width: 2.5 mm; ratio width/length of pronotum: 2.0; ratio width of pronotum/width of head: 1.23; ratio length/width of elytra: 1.27.

Colour. Deep black, elytra with faint bluish lustre, bimaculate, with a large, moderately distinct, reddish, irregularly triangular humeral spot that extends from the position of 2nd stria to 8th stria though is not in contact to any part of margin. Palpi and antenna reddish-piceous, three basal antennomeres slightly lighter than rest. Legs blackish, only apical part of tibiae, and tarsi reddish-piceous. Undersurface black.

Head. Wide. Frons anteriorly in middle depressed, this depression prolonged onto clypeus. In centre of frons, posteriorly to apical depression, a deep, punctiform groove. Lateral impressions of frons deep, with about tree or four rather irregular longitudinal furrows, the median one ending posteriorly in a deep, ovalish groove. Eyes large, markedly protruding, though head distinctly narrower than prothorax. Clypeo-frontal suture deep. Clypeus in middle depressed, anterior margin rather deeply excised, anterior angles rounded off, bisetose. Labrum elongate, considerably longer than wide, lateral borders oblique, apex straight, behind apex in middle with a small circular groove. Labrum 6-setose, the proximal seta far removed from apical margin, lateral margins apparently without additional hairs. Mandible with some longitudinal furrows on upper surface. Terminal palpomere of labial palpus as long as penultimate palpomere, apparently impilose. Maxillary palpus with sparse and very fine pilosity. Mentum with sharp, unidentate tooth. Antenna short, barely attaining basal angle of pronotum, median antennomeres but slightly longer than wide, densely pilose from apex of 4th antennomere, basal antennomeres sparsely setose. Microreticulation absent from frons and clypeus, present and isodiametric on labrum. Frons and clypeus irregularly punctate, surface highly glossy, apparently devoid of any pilosity.

Pronotum. Very wide, somewhat heart-shaped. Apex slightly wider than base, slightly concave, anterior angles rounded off. Sides almost evenly rounded, widest in anterior third, at anterior lateral seta. At this position margins with a very obtuse angle. Near basal angle with a short and faint sinuosity. Basal angles rectangular, laterally even faintly projecting. Base laterally straight, in middle gently pedunculate. Base bordered throughout, apex unbordered in middle. Lateral channel rather narrow throughout. Disk in middle somewhat raised. Median line distinct, in middle deeply impressed. Basal grooves fairly deep, oblique, prebasal transverse sulcus distinct. In middle between median line and lateral margin with a large, oblong, moderately deep groove. Anterior marginal seta situated in anterior third, at widest diameter of prontoum, posterior marginal seta situated at basal



Figs 1, 2. Habitus. **1.** *Minuthodes biplagiata*, spec. nov. **2.** *M. multisetosa*, spec. nov. Lengths: 5.2 mm; 5.6 mm.

angle. Microreticulation absent, puncturation irregular, fine and rather sparse on disk, coarse and denser laterally and apically. Surface glossy, with moderately dense, rather short, declined, yellow pilosity.

Elytra. Rather short and wide, widest behind middle, depressed. Humeri evenly rounded, sides gently convex, apex oblique, deeply sinuate, sutural angles rounded off, elytra slightly dehiscent at suture. Marginal channel slightly widened at anterior third. Striae almost absent, microreticulation absent, though whole surface densely punctate and pilose. Pilosity yellow, rather short, somewhat declined. Three discal pores situated at position of 3rd stria, though pores and the very short setae hardly discernible within the dense puncturation and pilosity. Marginal setae very elongate. Lateral margin extremely finely serrate and very sparsely pilose. Surface glossy. Posterior wings fully developed.

Lower surface. Proepisternum and prosternum impunctate and impilose, lower surface of hind body rather sparsely punctate and pilose. Metepisternum almost 2× as long as wide at apex. Terminal abdominal sternum of female 4-setose.

Legs. Structure of ♂ protarsus unknown.

♂ genitalia. Unknown.

♀ genitalia. Stylomere 2 rather short, with one large dorsomedial ensiform seta and two large mediolateral ensiform setae.

Variation. Unknown.

Distribution. Salawati Island off the Vogelkop peninsula, Irian Jaya. Known only from type locality.

Colecting circumstances. Not recorded, though the species lives most probably under the bark of trees in rain forest. Holotype collected in lowland.

Etymology. The name refers to the biplagiate pattern of the elytra.

Relationships. This species belongs to the group that includes *M. regularis* Darlington and the related *M. irregularis* Darlington (see below under *M. multisetosa*) from the New Guinean mainland and *M. simplex* Darlington from Goodenough Island.

Minuthodes multisetosa, spec. nov.

Figs 2, 3

Types. Holotype: ♂, Irian Jaya, Vogelkop, Meydougda, 1200-1400 m, 5.4.1993, leg. A. Riedel (ZSM-CBM). – Paratypes: 1♀, Irian Jaya, Pr. Manokwari, Testega, 1100-1200 m, 11.4.1993, leg. A. Riedel (CBM); 1♀, Goroka, New Guinea, 25/4/75, R. Hornabrook (MNZ).

Diagnosis. In shape and colour pattern very similar to *Minuthodes regularis* Darlington, though easily distinguished by the multiplication of the anterior marginal setae of the pronotum and by the series of conspicuously elongate setae on the 3rd, 5th, and 7th intervals of the elytra.

Description

Measurements. Length: 5.3-5.85 mm; width: 2.55-2.80 mm; ratio width/length of pronotum: 2.06-2.10; ratio width of pronotum/width ofhead: 1.33-1.39; ratio length/width of elytra: 1.27-1.30.

Colour. Black, posterior part of head with an indistinct, dark red, circular spot on either side. Elytra conspicuously quadrimaculate, with a large, orange, somewhat triangular humeral spot that extends from position of 3rd stria to 8th stria, and with a likewise large, irregularly transverse subapical spot of same colour that extends from position of 1st stria almost to 8th stria. Both spots not in contact to any part of basal, lateral, or apical margin. Palpi black, antennae black, though reddish from 2nd to basal half of 4th antennomere. Legs including tarsi black. Undersurface black.

Head. Wide. Frons anteriorly in middle with a deep, oblong fovea. Lateral impressions of frons shallow, with about tree rather irregular, longitudinal furrows, the median one ending posteriorly in a deep, oblong groove. Eyes large, markedly protruding, though head distinctly narrower than prothorax. Clypeo-frontal suture deep. Clypeus without distinct impression, anterior margin very faintly excised, anterior angles shortly rounded off, bisetose. Labrum fairly elongate, slightly longer than wide, lateral borders convex, apex straight. Labrum 6-setose, the proximal seta removed from apical margin, lateral margins apparently without additional hairs. Mandible with some longitudinal furrows on upper surface. Terminal palpomere of labial palpus as long as penultimate palpomere, apparently impilose. Maxillary palpus with sparse and very fine pilosity. Mentum with sharp, unidentate tooth. Antenna short, barely attaining basal angle of pronotum, median antennomeres but slightly longer than wide, densely pilose from apex of 4th antennomere, basal antennomeres sparsely setose. Microreticulation absent from frons and clypeus, present and isodiametric though rather superficial on labrum. Frons and clypeus coarsely though rather irregularly punctate, surface highly glossy, with rather sparse, anteriorly inclined, yellow pilosity.

Pronotum. Remarkably short and wide, somewhat heart-shaped. Apex slightly narrower than base, slightly concave, anterior angles very widely rounded off. Sides anteriorly markedly convex, evenly rounded, widest behind anterior third, about at position of the most posteriorly situated seta of the anterior group (actually the original anterior lateral seta). Near basal angle with a short and faint sinuosity. Basal angles obtuse, basal border laterally obliquely convex, incurved to basal angle. Base in middle gently pedunculate. Base coarsely bordered throughout, apex with weak or even shortly interrupted border in middle. Lateral channel rather narrow throughout. Disk in middle distinctly raised. Median line distinct, in middle deeply impressed. Basal grooves fairly deep, oblique, prebasal transverse sulcus deep. Anterior transverse sulcus rather shallow, oblique. In middle between median line and lateral margin with a shallow, rather indistinct, about circular groove, laterally of this with a fairly distinct depression that separates the raised disk from the depressed lateral part. Apical part of lateral margin with three or four elongate lateral setae and several shorter hairs, though the most posteriorly situated seta (the original anterior marginal seta) is the longest. Posterior marginal seta situated at basal angle. Microreticulation absent, puncturation rather fine and fairly dense. Surface glossy, with moderately dense, fairly elongate, slightly declined, yellow pilosity.

Fig. 3. *Minuthodes multisetosa*, spec. nov. Male genitalia: aedeagus, lateral view; right and left parameres; genital ring. Scale: 0.25 mm.

Elytra. Rather short and wide, widest at middle, depressed. Humeri evenly rounded, sides in middle almost straight, apex oblique, gently sinuate, sutural angles rounded off, elytra slightly dehiscent at suture. Marginal channel slightly widened at anterior third. Striae very indistinct, though intervals visible as low ridges. 3rd stria with 3-4, basal part of 5th stria with 1-2, and basal half of 7th stria with 2-3 very elongate, erect setae. Marginal setae very elongate. Lateral margin extremely finely serrate and sparsely pilose. Microreticulation absent, though whole surface densely punctate and pilose. Pilosity yellow, rather short, declined posteriorly. Surface highly glossy. Posterior wings fully developed.

Lower surface. Proepisternum impunctate, prosternum sparsely punctate and pilose at anterior margin. Lower surface of mesothorax and mesothorax very sparsely punctate and pilose; abdomen more densely pilose. Metepisternum almost 2 × as long as wide at apex. Terminal abdominal sternum quadrisetose in both sexes.

Legs. Four basal tarsomeres of protarsus in the male slightly widened and biseriately squamose, though 4th tarsomere with few squamae only.

♂ genitalia. Genital ring elongate, almost symmetric. Aedeagus rather curved, lower surface in apical half straight, apex straight, fairly short. Orificium rather elongate, turned to left side. Internal sac rather complexly folded, without any sclerites. Parameres very dissimilar, right paramere small, elongate, left paramere larger, rather triagonal.

♀ genitalia. Stylomere 2 rather short, with one large dorsomedial ensiform seta and two large mediolateral ensiform setae.

Variation. Apart from some variation in size, little variation noted.

Distribution. Apparently widely distributed on the New Guinean mainland, since the species was collected in central Papua New Guinea and on the Vogelkop in westernmost Irian Jaya.

Collecting circumstances. Not recorded, though the species lives most probably under the bark of trees in rain forest. All specimens were collected at median altitude.

Etymology. The name refers to the multiplication of setae on pronotum and elytra.

Relationships. Probably this species is most closely related to *M. regularis* Darlington and the somewhat doubtful *M. irregularis* Darlington which perhaps is only a colour variation of the first species.

Recognition

In Darlington's (1968) key to the New Guinean species of *Minuthodes* both new species would key out at couplet 5. Therefore, Darlington's key should be followed to this entry and then altered as below:

5. Elytra metallic blue-black .... *metallica* Darlington
– Elytra not metallic, black with or without reddish or yellow spots .... 6.
6. Elytra not plainly pubescent; shining black, immaculate or bimaculate or quadrimaculate, but if maculate at least one pair of spots elongate .... *sexualis* Darlington (for subspecies see couplets 6a and 6b in Darlington's key)
– Elytra plainly pubescent; when maculate spots not elongate .... 7.
7. Elytra black, unspotted. Goodenough Island .... *simplex* Darlington
– Elytro bimaculate or quadrimaculate .... 8.
8. Elytra bimaculate at humeri; apex of elytra rather deeply emarginate (Fig. 1). Salawati Island west of Vogelkop .... *biplagiata, spec. nov.*
– Elytra quadrimaculate; apex of elytra less deeply emarginate. Mainland of New Guinea .... 9.
9. Pronotum with several anterior lateral setae; elytra with rows of elongate setae on 3rd, 5th, and 7th intervals (Fig. 2) .... *multisetosa*, spec. nov.
– Pronotum with single anterior lateral seta; elytra with three short setae on 3rd interval only ... 10.
10. Smaller (length 4.0-5.3 mm); elytral spots about regular in outline .... *regularis* Darlington
– Larger (length 5.5-5.8 mm); elytral spots irregular in outline .... *irregularis* Darlington

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Holarctic species of *Trematopygodes* Aubert

(Insecta Hymenoptera, Ichneumonidae, Ctenopelmatinae)

Rolf Hinz (†) and **Klaus Horstmann**

Hinz, R. & K. Horstmann (1998): Holarctic species of *Trematopygodes* Aubert (Insecta Hymenoptera, Ichneumonidae, Ctenopelmatinae). – Spixiana **21/3:** 241-251

The Holarctic species of *Trematopygodes* Aubert are revised. Keys to females and to males are provided for 17 species. Ten species are described as new: *T. americator, T. californiae, T. luteator, T. mactator, T. minator, T. propinquator, T. rufipectus, T. similator* and *T. townesi* from U.S.A., and *T. koreator* from Korea.

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Introductory remarks by the junior author

After finishing his revision of the European species of *Trematopygodes* Aubert (Hinz 1980), Rolf Hinz started a revision of the Holarctic species of that genus. He studied the types of three described Nearctic species, borrowed material, mainly from the Townes collection (Gainesville), but also from museums in Washington (D.C.) and East Lansing, sorted it to species, determined the described and named the undescribed species, labelled the holotypes of the new species, and produced keys to females and to males. Then he stopped this project for an unknown reason. The junior author found some additional characteristics and drew up the notes on the described species and the descriptions of the new species. The authors of the new species are therefore Hinz et Horstmann.

The following colleagues kindly gave access to specimens in their care: R. W. Carlson (U. S. National Museum of Natural History, Smithsonian Institute, Washington, D.C.), R. Fischer and F. W. Stehr (Michigan State University, East Lansing), M. Fitton and L. Tarel (Natural History Museum, London), D. Otte and D. Azuma (Academy of Natural Sciences, Philadelphia), H. Townes (†) and D. B. Wahl (American Entomological Institute, Gainesville) and K. W. R. Zwart (Laboratorium voor Entomologie, Wageningen). R. W. Carlson also helped with information about the dates of publication of Davis (1897-1898) and about localities and depositories of some specimens.

Key to females

1. Gaster black; at most some segments with yellow or red edges. .... 2.
– Gaster with at least one segment completely red, in many species only small frontal and caudal parts of the gaster black, or gaster completely red .... 8.

2. Mesosternum and mesopleura distinctly yellowish red, at most a small central part of the mesosternum and the dorsal edges of the mesopleura black. Coxae red. North America ....
.... *rufipectus*, spec. nov.

– Mesosternum and mesopleura black, at most some parts tinged with red. Coxae black (except in *T. americator*) .... 3.

3. Antennae very short, the flagellum with 20-24 segments, the 7th flagellar segment as long as wide. North America .... *californiae*, spec. nov.

– Antennae longer, the flagellum with more than 24 segments, the 7th flagellar segment distinctly longer than wide .... 4.

4. Malar space very short, about half as wide as the distal end of the first flagellar segment .... 5.

– Malar space about 1.5 times as wide as the distal end of the first flagellar segment .... 6.

5. First segment of gaster with conspicuous subbasal dorsolateral lobes. Hind femurs red. Europe .... *auriculator* Hinz, 1980

– First segment of gaster with at most very indistinct subbasal dorsolateral lobes. Hind femurs black. Europe .... *femorator* Hinz, 1980

6. Temples shorter than eyes (seen from above). Frons coriaceous, a very fine punctation hardly visible. Coxae red. North America .... *americator*, spec. nov.

– Temples longer than eyes. Frons distinctly and densely punctate. Coxae black .... 7.

7. Flagellum with 25-31 segments. Propodeum with a strong and dense punctation, without an area superomedia. First segment of gaster without dorsal carinae or a dorsal longitudinal furrow. Clypeus black. Europe .... *aprilinus* (Giraud, 1872)

– Flagellum with 36-41 segments. Propodeum with a less dense punctation, the punctures as wide as their interspaces, the area superomedia indicated. First segment of gaster basally with short dorsal carinae and with a longitudinal furrow between them. Clypeus reddish apically. Europe .... *rarus* Horstmann, 1990

8. Thorax and propodeum for the greater part black, usually the head also black .... 9.

– Head, thorax and propodeum for the greater part red .... 13.

9. Mandibular teeth equal. Face coriaceous and dull, a punctation hardly visible. Dorsal part of propodeum coriaceous and/or rugose, less punctate .... 10.

– Lower mandibular tooth somewhat larger than the upper one. Face and dorsal part of propodeum with a distinct punctation on a rather smooth and shining background .... 11.

10. Lateral flaps of the ventral edge of the clypeus much longer than the median subventral projection. Face with yellow spots below the bases of antennae or completely yellowish red. Frons with yellow spots dorsally or with the orbits yellowish red. North America .... *osflavus* (Davis, 1897)

– Lateral flaps of the ventral edge of the clypeus not much longer than the median subapical projection. Face and frons black. North America .... *propinquator*, spec. nov.

11. Head, thorax and propodeum with a dense and strong punctation, the punctures at least as wide as their interspaces. Flagellum with 39 segments. Area petiolaris distinctly bounded frontally. Korea .... *koreator*, spec. nov.

– Head, thorax and propodeum with a less dense punctation. Flagellum with 24-30 segments. Area petiolaris not or only indistinctly bounded frontally .... 12.

12. Flagellum with 28-30 segments, the 4th flagellar segment 1.8-2.0 times as long as wide. Head and pronotum black, at most two reddish spots below the antennal sockets, and the dorsal hind corners of pronotum yellow. Hind coxae for the greater part black, at most the apical 0.3 red. First segment of gaster black. North America .... *frontosus* (Davis, 1897)

– Flagellum with 24-27 segments, the 4th flagellar segment 2.1-2.5 times as long as wide. Head, pronotum, hind coxae and first segment of gaster in many specimens with more extensive reddish markings. North America .... *townesi*, spec. nov.

13. Lower mandibular tooth somewhat larger than the upper one. Mesopleura on the lower half with very fine punctures on a smooth background, the punctures about 0.3 times as wide as their

interspaces. Area petiolaris and the hind lateral areas not bounded frontally. North America. .... *mactator*, spec. nov.

– Mandibular teeth equal. Mesopleura on the lower half either coriaceous or with a denser punctation. Area petiolaris and the hind lateral areas distinctly bounded frontally .... 14.

14. Clypeus with a very conspicuous nose-like projection medially subventrally, which extends in ventral direction as far as the apical flaps. Flagellum with 35 segments. Body almost completely reddish, the ocellar triangle also red. North America .... *luteator*, spec. nov.

– Clypeus with a shorter median subventral projection. Number of flagellar segments different. The ocellar triangle in most specimens darkened .... 15.

15. Flagellum with 39 segments. Thorax and propodeum with some black spots and edges. Second tergite of gaster with a fine and dense punctation on a poorly structured background. North America .... *similator*, spec. nov.

– Flagellum with 27-29 segments. Thorax and propodeum with almost no black parts. Second tergite of gaster coriaceous and slightly rugose, a punctation hardly visible .... 16.

16. Temples not constricted directly behind the eyes (seen from above). Mesopleura on the lower half with a fine and rather dense punctation on a slightly coriaceous background. Malar space broadly yellow. North America .... *oculatus* (Davis, 1897)

– Temples constricted directly behind the eyes. Mesopleura on the lower half coriaceous, a punctation hardly visible. Malar space as reddish as other parts of the head. North America .... *minator*, spec. nov.

Key to males

(males of *T. americator, auriculator, koreator, luteator, mactator, minator, oculatus* and *rufipectus* unknown)

1. Gaster black, at most some segments with yellow or red edges .... 2.

– Gaster red medially, at least one segment completely red .... 6.

2. Antennae short, flagellum with 20-22 segments, the 7th flagellar segment 1.4-1.7 times as long as wide. North America .... *californiae*, spec. nov.

– Antennae longer, at least with 24 segments, the 7th flagellar segment 1.8-2.1 times as long as wide .... 3.

3. Malar space about half as wide as the distal end of the first flagellar segment. Hind femurs black. Europe .... *femorator* Hinz, 1980

– Malar space wider than the distal end of the first flagellar segment. Hind femurs red .... 4.

4. Temples, ventral half of mesopleura and dorsal part of propodeum with a strong and dense punctation, in many parts the punctures wider than their interspaces. Temples for the greater part black, only the outer orbits yellow. Tergites of gaster black, at most with narrow lateral yellow edges. Europe .... *aprilinus* (Giraud, 1872)

– Temples, mesopleura and propodeum with a less strong and dense punctation. The lower 0.6 of the temples yellow. Gaster with more extensive yellow or reddish markings .... 5.

5. Mandibular teeth equal. Flagellum with 33 segments. Area petiolaris and the hind lateral areas distinctly bounded frontally. Frontal tergites of gaster with a strong punctation on a smooth background, in some parts the punctures not wider than their interspaces. Europe .... *rarus* Horstmann, 1990

– Lower mandibular tooth somewhat larger than the upper one. Flagellum with 27 segments. Area petiolaris and the hind lateral areas not bounded frontally. Frontal tergites of gaster with a fine and very dense punctation on a slightly coriaceous background. North America (1♂ Potrero, San Diego Co., Cal., 15.IV.1974, H. & M. Townes; Gainesville) .... spec. indet.

6. Flagellum with 35 segments. Head and thorax for the greater part light red, with some black markings. North America .... ? *similator*, spec. nov.
– Flagellum at most with 30 segments. Head and thorax black and yellow, or for the greater part yellow, with some light red and black markings .... 7.
7. Mandibular teeth equal. Face coriaceous, a punctation hardly or not at all visible. Dorsal part of propodeum coriaceous or rugose, less punctate. Area petiolaris and the hind lateral areas distinctly bounded frontally .... 8.
– Lower mandibular tooth somewhat larger than the upper one. Face and dorsal part of propodeum with a distinct punctation on a rather smooth and shining background. Area petiolaris and the hind lateral areas not bounded frontally .... 9.
8. Dorsal part of propodeum coriaceous. Mesoscutum with large yellow shoulder marks. Scutellum reddish frontally. North America .... ? *osflavus* (Davis, 1897)
– Dorsal part of propodeum partly rugose. Mesoscutum and scutellum black. North America ....*propinquator*, spec. nov.
9. Flagellum with the 4th segment 2.1-2.2 times as long as wide. Frons, vertex, temples and thorax for the greater part black, with reduced yellow markings. First segment of gaster black. North America ....*frontosus* (Davis, 1897)
– Flagellum with the 4th segment 2.6-3.0 times as long as wide. Head and thorax for the greater part yellow, with reduced red and black markings. Postpetiolus at least caudally red. North America .... *townesi*, spec. nov.

Remarks on the described species

Trematopygodes aprilinus (Giraud, 1872)

This species was revised by Hinz (1980: 91). Additional host: *Periclista pubescens* (Zaddach) (Hymenoptera, Tenthredinidae), leg. H. Weiffenbach (coll. Hinz). Additional localities: 20♂♂, New Forest, S. H., England, 8.-10.V.1960, J. F. & R. A. Perkins (London); 2♀♀, Merzifon, 3000 ft., Prov. Amasya, Turkey, 3.VI.1959, K. M. Guichard (London).

Trematopygodes auriculator Hinz, 1980

Additional locality: 1♀, Burgst/Breda, N. B., Netherlands, V.1914, C. A. L. Smits van Burgst (Wageningen).

Trematopygodes femorator Hinz, 1980

Additional locality: 1♀, Mte Caramola, Francavilla in Sinni, Prov. Potenza, Italy, 5.VI.1984, P. L. Scaramozzino (coll. Hinz).

Trematopygodes frontosus (Davis, 1897)[1]

This species is very similar to *T. townesi*, spec. nov. in both sexes, and differs by the characteristics given in the keys.

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[1] The paper by Davis (1897-1898) came out in two parts, and the description of *Labrossyta frontosa* Davis is included in the part published in 1897, and not in 1898, as was indicated by Carlson (1979: 588) and Yu & Horstmann (1997: 447).

The lectotype (♀, from "W.T.", Wash.; Philadelphia) was revised by Cresson (1928: 17) and by the senior author. Additional localities: 1♀, 1♂, Lowman, 4000ft., Ida., 9.-14.VI.1978, H. & M. Townes; 1♀, Pinehurst, Ore., 29.VI.1978, H. & M. Townes; 1♂, Selma, Ore., 20.V.1978, H. & M. Townes; 2♂♂, Corvallis, Ore., 13.-14.V.1976, H. Townes; 1♂, Juntura, Ore., 19.V.1976, H. & M. Townes; 2♂♂, Tuscarora, Nev., 4.VI.1978, H. & M. Townes; 1♂, Estes Pk., Colo., 15.VI.1948, Townes family; 1♀, Parker Creek, Sierra Ancha, Ariz., 4.V.1947, H. & M. Townes; 2♀♀, Oak Creek Canyon, Ariz., 17.-18.V.1947, H. & M. Townes (all Gainesville).

Trematopygodes oculatus (Davis, 1897)

This species is similar to *T. luteator*, spec. nov., and differs by the following characteristics: Subapical swelling of clypeus not much extended in ventral direction. Malar space 1.5-1.6 times as wide as distal end of first flagellar segment. Flagellum with 29 segments (but flagellum complete in one studied specimen only), the 4th flagellar segment 2.0-2.2 times as long as wide. Ocellar triangle red in the material from Texas, but black in the specimen from Michigan.

The lectotype (♀, from Texas; Philadelphia) was revised by Cresson (1928: 21). Paralectotypes, also from Texas, are in Washington, D. C. (2♀♀) and in Gainesville (1♀) and were revised by the present authors. Additional locality: 1♀, Roscommon Co., Mich., 26.V.1957, R. & K. Dreisbach (Gainesville).

Trematopygodes osflavus (Davis, 1897)

This species, *T. americator*, spec. nov. and *T. rufipectus*, spec. nov. differ distinctly in colour (see key to females), but almost not in structure. They are not treated as subspecies of one species here, because they are partly sympatric. The male is only tentatively associated with the female.

The holotype (♀, from Michigan; East Lansing) was revised by the senior author. Additional localities: 1♀, Chaffeys Locks, Ont., 20.VI.1975, J. Bellwood; 1♂, Ithaca, N.Y., 8.V.1936, H. Townes; 1♀, Raleigh, N.C., 26.IV.1953, H. & A. Howden (all Gainesville); 1♀, locality unknown, H. G. Dyar (Washington, D. C.). The specimen from Raleigh was figured by Townes (1970: 241). The specimens from N. Y. and Pa. mentioned by Townes & Townes (1951: 327) are transferred to *T. rufipectus*, spec. nov. (see below).

Trematopygodes rarus Horstmann, 1990

This species was revised by Hinz (1980: 91; under the name *T. blancoburgensis* Schmiedeknecht) and by Horstmann (1990: 47). Additional locality: 1♀, 1♂, Bilecik, Turkey, 1.V.1962, Guichard & Harvey (London).

Descriptions of new species

Trematopygodes americator, spec. nov.

Types. Holotype: ♀, "Delaware Co., O., V-21", "D.J. & J.N. Knull Collrs." (Gainesville). – Paratypes: 1♀, Greenville, S.C., 13.V.1956, L. & G. Townes (Gainesville); 1♀, Ann Arbor, Mich., 8.VI.1963, H. & M. Townes (Coll. Hinz); 1♀, Mount Pleasant, Ia., 10.V.1934 (Washington, D.C.).

Description

♀ Holotype. Length of front wings 6.0 mm. Body length 7.5 mm.

Temples somewhat shorter than eyes, not restricted directly behind the eyes (seen from above). Mandibular teeth equal. Clypeus with the apical flaps distinctly protruding, the subapical swelling distinct, but not much extended in ventral direction. Malar space 1.5 times as wide as the distal end of the first flagellar segment. Flagellum with 34-37 segments, the 4th flagellar segment 2.0-2.1 times as long as wide. Face and frons coriaceous and dull, the former with a fine and dense, the latter with a very fine punctation. Temples shining, with a fine and rather dense punctation on a slightly coriaceous

background. Mesoscutum shining, with a fine and dense punctation on a slightly coriaceous background, the punctures about as wide as their interspaces. Mesopleura shining, smooth or very slightly coriaceous, outside of the large speculum with a fine and rather dense punctation, the punctures narrower than or as wide as their interspaces. Metapleura with a dense punctation on a smooth background. Tarsal claws strongly pectinate, the subapical teeth almost as long as the apical ones. Dorsal part of propodeum more or less distinctly coriaceous and with a fine punctation. Area superomedia indicated by a furrow, sometimes also bounded by carinae. Area petiolaris and the hind lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes. First and second tergites of gaster coriaceous and with a very dense punctation, rather dull, the caudal tergites more shining.

Colour. Black. Mandibles (except teeth), apical part of clypeus, small parts of cheeks, dorsal hind corner of pronotum, subtegular ridge (not always) and tegulae yellow. Ventral parts of scape, pedicel and flagellum yellowish. Legs light red, the front and middle trochanters yellow, the tarsi darkened distally. Mesopleura sometimes tinged with red. Pterostigma dark brown, the proximal corner paler.

♂. Unknown.

Trematopygodes californiae, spec. nov.

Types. Holotype: ♀, "Potrero, S. D. Co., Calif., IV.11.74, H. & M. Townes" (Gainesville). – Paratypes: 7♀♀, 2♂♂, from the same place and collectors, 11.-16.IV.1974 (Gainesville, 1♀, 1♂, coll. Hinz); 1♀, 1♂, Strawberry, Cal., 28.VI.1948, H., M., G. & D. Townes; 1♂, Camino, Cal., 30.VI.1948, same collectors; 1♀, Dardanelle, Cal., 2.VII.1948, same collectors; 2♀♀, Corvallis, Ore., 13.-15.V.1976, H. K. Townes (all Gainesville).

Description

♀ Holotype. Length of front wings 3.9 mm. Body length 5.4 mm.

Temples somewhat shorter than eyes (seen from above), not restricted directly behind eyes. Mandibular teeth equal. Clypeus with the apical flaps narrow and almost not protruding, the subapical swelling distinct, but not much extended in ventral direction. Malar space as wide as the the distal end of the first flagellar segment. Flagellum with 20-24 segments, the 4^{th} flagellar segment 1.6 times, the 7^{th} segment about 1.0 times as long as wide. Face, frons, temples, mesoscutum, mesopleura outside of the speculum, metapleura, dorsal part of propodeum and tergites of the gaster with a strong and dense or very dense punctation on a smooth background, in most parts the punctures wider than their interspaces. Tarsal claws not strongly pectinate, the subapical teeth almost half as long as the apical ones. Area superomedia not indicated. Area petiolaris and the hind lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes.

Colour. Black. Mandibles (except teeth), apical part of clypeus, ventral part of scape, dorsal hind corner of propodeum and tegulae yellow. In some specimens clypeus and scape black. Legs reddish, all coxae and the hind trochanters black, apices of the femurs and bases of the tibiae indistinctly yellowish. In some specimens the front trochanters yellow, in others the hind femurs tinged with brown or black. Pterostigma brown or dark brown, the proximal corner whitish.

♂. Clypeus without apical flaps. Flagellum with 20-22 segments, the 4^{th} segment 1.6-1.8 times, the 7^{th} segment 1.4-1.7 times as long as wide. Yellow markings more extended: clypeus, face, cheeks, malar space, underside of scape and pedicel, ventral corner of pronotum (not always), shoulder marks, apices of front and middle coxae and front and middle trochanters also yellow. In some specimens the clypeal groove and a ventral line on the face black.

Trematopygodes koreator, spec. nov.

Holotype: ♀, "Suigen Korea, 20-V-1931", "K. Sato collector" (Gainesville).

Description

♀ Holotype. Length of front wing 6.3 mm. Body length 7.7 mm.

Temples somewhat shorter than eyes, slightly constricted directly behind the eyes (seen from above). Lower mandibular tooth somewhat larger than the upper one. Clypeus with the apical flaps rather narrow and not much protruding, the subapical swelling distinct, but not much extended in

ventral direction. Malar space about as wide as the distal end of the first flagellar segment. Flagellum with 39 segments, the 4th flagellar segment 2.1 times as long as wide. Face, frons, temples, mesoscutum, mesopleura outside of the speculum, metapleura, dorsal part of propodeum and tergites of the gaster with a rather strong and dense punctation on a smooth background, the punctures about as wide as or in most parts wider than their interspaces. Tarsal claws strongly pectinate, the subapical teeth almost as long as the apical ones. Area superomedia not indicated. Area petiolaris and the hind lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes.

Colour. Black. Mandibles (except teeth), apical part of clypeus, small parts of cheeks, dorsal hind corner of pronotum, subtegular ridge and tegulae yellow. Ventral parts of scape, pedicel and flagellum, apices of the front and middle coxae and all trochanters yellowish, the distal part of flagellum yellowish red on the dorsal side, too. Femurs, tibiae and tarsi of the front and middle legs yellowish red, of the hind legs light red. Caudal corners of postpetiole, the second and third tergites of gaster and lateral edges of the forth tergite red. Pterostigma brown.

♂. Unknown.

Trematopygodes luteator, spec. nov.

Holotype: ♀, "Monte Sano St. Pk., Ala., IV.9.1955, H. & A. Howden" (Gainesville).

Description

♀ Holotype. Length of front wings 6.0 mm. Body length 7.9 mm.

Temples somewhat shorter than eyes, not restricted directly behind eyes (see from above). Mandibular teeth equal. Clypeus with the apical flaps distinctly protruding, the subbasal swelling as a conspicuous nose-like projection, which extends in ventral direction as far as the apical flaps. Malar space as wide as the distal end of the first flagellar segment. Flagellum with 35 segments, the 4th flagellar segment 1.9 times as long as wide. Face and frons coriaceous, rather dull, on the latter a fine punctation hardly visible. Temples more shining, very slightly coriaceous and with very fine punctures. Mesoscutum and mesopleura outside of the large speculum with a fine and rather dense punctation on a very slightly coriaceous background, the punctures half as wide as or as wide as their interspaces, the background in some parts smooth. Metapleura with a fine and dense punctation on a rather smooth background. Tarsal claws strongly pectinate, the subapical teeth almost as long as the apical ones. Dorsal part of propodeum coriaceous and with fine punctures. Area superomedia indicated by some wrinkles. Area petiolaris and hind lateral areas distinctly bounded frontally. Petiolus with faint dorsal carinae, without subbasal dorsolateral lobes. First and second tergites of gaster coriaceous and with a dense punctation, the caudal tergites more shining.

Colour. Light red. Mandibles (except teeth), malar space, inner orbits, dorsal hind corner of pronotum, tegulae and subtegular ridge yellow. Frontal part of mesoscutum with a black spot. Pterostigma light brown.

♂. Unknown.

Trematopygodes mactator, spec. nov.

Types. Holotype: ♀, "Potrero, S. D. Co., Calif., IV.9.1974, H. & M. Townes" (Gainesville). – Paratype: 1♀, Descanso, Cal., 11.IV.1974, H. & M. Townes (Gainesville).

Description

♀ Holotype. Length of front wing 4.7 mm. Body length 5.4 mm.

Temples almost as long as eyes, slightly constricted directly behind the eyes (seen from above). Lower mandibular tooth somewhat larger than the upper one. Clypeus with the apical flaps distinctly protruding, the subapical swelling distinct, but not extended in ventral direction. Malar space 1.3 times as wide as the distal end of the first flagellar segment. Flagellum with 26-27 segments, the 4th segment 2.4 times as long as wide. Face and frons slightly coriaceous, shining, the former with a rather dense, the latter with a less dense punctation. Temples almost smooth, with a very fine punctation. Mesoscutum with a fine punctation on a smooth background, the punctures about half as wide as their interspaces. Mesopleura outside of the large speculum with a very fine and sparse punctation on a

smooth background, the punctures about 0.3 times as wide as their interspaces. Metapleura with a fine and sparse punctation on a smooth background. Tarsal claws not strongly pectinate, the subapical teeth about half as long as the apical ones. Dorsal part of propodeum with a fine and sparse punctation on a smooth background, the punctures half as wide as their interspaces. Area superomedia not indicated. Area petiolaris and hind lateral areas not bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes. First and second tergites of gaster with a fine and very dense punctation on a slightly coriaceous background, the punctation on the caudal tergites less dense.

Colour. Light red. Mandibles (except teeth), malar space, dorsal hind corner of pronotum, tegulae and subtegular ridge yellow. Pterostigma medium brown, the proximal corner paler.

♂. Unknown.

Trematopygodes minator, spec. nov.

Holotype: ♀, "Takoma Pk., Md., V.6.1943, H. & M. Townes" (Gainesville).

Description

♀ Holotype. Length of front wings 4.2 mm. Body length 4.6 mm.

Temples shorter than eyes, distinctly constricted directly behind the eyes (seen from above). Mandibular teeth equal. Clypeus with the apical flaps distinctly protruding, the subapical swelling distinct and somewhat extended in ventral direction. Malar space about 1.5 times as wide as the distal end of the first flagellar segment. Flagellum with 27 segments, the 4th flagellar segment 1.8 times as long as wide. Face and frons coriaceous, dull. Temples shining, slightly coriaceous and with a very fine punctation hardly visible. Mesoscutum shining, slightly coriaceous, with a very fine punctation, the punctures about as wide as their interspaces. Mesopleura outside of the speculum coriaceous, with a very fine punctation hardly visible. Metapleura with a fine and dense punctation on a rather smooth background. Tarsal claws rather conspicuously pectinate, the subapical teeth about 0.7 times as long as the apical ones. Dorsal part of propodeum coriaceous. Area superomedia not indicated. Area petiolaris and hind lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes. First and second tergites of gaster slightly coriaceous and with a very fine and rather dense punctation, the caudal tergites less punctate and more shining.

Colour. Light red. Dorsal hind corner of pronotum and tegulae yellow. Ocellar triangle and vertex blackish. Some small parts of the thorax and the base of the petiolus with black markings. Pterostigma yellowish brown.

♂. Unknown.

Trematopygodes propinquator, spec. nov.

Types. Holotype: ♀, "St. Charles, Mich., Saginaw Co., 24 May 1968, James G. Truchan, ex: Rotary Trap" (East Lansing). – Paratypes: 6♀♀, 8♂♂, from the same place and collector (East Lansing, 1♀, 1♂, Coll. Hinz); 1♀, McHenry Co., N. D., 4.-11.VI.1970, M. E. McKneight (Gainesville); 1♂, Ann Arbor, Mich., 23.V.1962, H. & M. Townes (Gainesville); 1♀, Bottineau Co., N. D., 17.VI.1971, em. 4.III.1972 ex sawfly on *Fraxinus pennsylvanica*, A. G. Tagestad (Washington, D. C.); 1♂, Shadehill Reservoir, Perkins Co., S. D., 8.VI.1971, em. IV.1972 ex *Eupareophora parca*, A. G. Tagestad (Washington, D. C.).

Description

♀ Holotype. Length of front wings 4.5 mm. Bogy length 5.4 mm.

Temples shorter than eyes, not constricted directly behind the eyes (seen from above). Mandibular teeth equal. Clypeus with the apical flaps conspicuous, but not much protruding, the subapical swelling somewhat extended in ventral direction, almost as long as the apical flaps. Malar space 1.2 times as wide as the distal end of the first flagellar segment. Flagellum with 23-25 segments, the 4th flagellar segment 2.2-2.4 times as long as wide. Face and frons coriaceous, dull, the latter with an additional fine punctation. Temples shining, with a very fine punctation on a slightly coriaceous background. Mesoscutum shining, with a rather dense punctation on a slightly coriaceous background, in most parts the punctures about as wide as their interspaces. Mesopleura much shining, smooth or very slightly coriaceous, outside of the large speculum with a very fine and sparse punctation, the

punctures about 0.3 times as wide as their interspaces. Metapleura shining, with a fine punctation on a slightly coriaceous background. Tarsal claws indistinctly pectinate, the subapical teeth short and sparse. Dorsal part of propodeum with a dense punctation on a rather smooth background, partly rugose. Area superomedia indicated by a furrow and some wrinkles. Area petiolaris and the hind lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes. First and second tergites of gaster with a fine and dense punctation on a slightly coriaceous background, the caudal tergites more shining.

Colour. Black. Mandibles (except teeth), clypeus, small parts of the cheeks, ventral parts of scape, pedicel and base of flagellum, dorsal and ventral hind corners of pronotum, tegulae and front and middle legs yellow or yellowish red. Hind legs and greater parts of the gaster light red, base of petiolus and the caudal tergites (from the 4th to 7th tergite on) black. Mesopleura and/or mesosternum tinged with red. In some specimens the mesosternum reddish. Pterostigma dark brown.

♂. Clypeus with very short apical flaps. Flagellum with 21-25 segments, the 4th flagellar segment 2.1-2.2 times as long as wide. Yellow markings more extended: Face, malar space, cheeks, ventral parts of temples, frontal orbits (sometimes interrupted in the middle) and ventral part of the mesopleura also yellow. In some specimens the mesosternum reddish.

Host. *Eupareophora parca* (Cresson) (Hymenoptera, Tenthredinidae).

Trematopygodes rufipectus, spec. nov.

Types. Holotype: ♀, "Haywood Co., N. C.", "H. V. Weems, Jr. Coll. 17.VI.55", "*Aruncus aruncus*" (Gainesville). – Paratypes: 1♀, Cleveland, S. C., 24.V.1961, G. F. Townes (Gainesville), 1♀, Spring Br., Pa., 7.VI.1945, H. K. Townes (Gainesville); 2♀♀, Ithaca, N. Y., 2.VI.1936, H. K. Townes (1♀, Gainesville, 1♀, coll. Hinz); 1♀, Brownswood, Tex., 5.V.1928, H. S. Aldair (Washington, D. C.).

Description

♀ Holotype: Length of front wing 5.9 mm. Body length 6.5 mm.

Temples somewhat shorter than eyes, not restricted directly behind eyes (seen from above). Mandibular teeth equal. Clypeus with the apical flaps distinctly protruding, the subapical swelling distinct, but not much extended in ventral direction. Malar space 1.7 times as wide as the distal end of the first flagelar segment. Flagellum with 29-35 segments, the 4th flagellar segment 2.0-2.2 times as long as wide. Face and frons coriaceous and dull, the former with a fine and dense, the latter with a very fine punctation. Temples shining, with a fine and rather dense punctation on a slightly coriaceous background. Mesoscutum shining, with a fine and dense punctation on a slightly coriaceous background, the punctures about as wide as their interspaces. Mesopleura shining, smooth or very slightly coriaceous, outside of the large speculum with a fine or very fine punctation, the punctures about half as wide as their interspaces (variable). Metapleura with a fine and rather dense punctation on a smooth background. Tarsal claws strongly pectinate, the subapical teeth almost as long as the apical ones. Dorsal part of propodeum coriaceous and with a fine or very fine punctation. Area superomedia indicated by a furrow, sometimes also bounded by carinae. Area petiolaris and the hind lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes. First and second tergites of gaster coriaceous and with a dense punctation, rather dull, the caudal tergites more shining.

Colour. Black. Mandibles (except teeth), apical part of clypeus, parts of the malar space and the cheeks, dorsal and ventral hind corners of pronotum, subtegular ridge and tegulae yellow. Ventral half of scape, pedicel and flagellum yellowish. In some specimens small parts of the face (below the antennal sockets) and of the vertex (next to the eyes) tinged with red. Front and middle legs yellow or yellowish red, hind legs light red, the tarsi darkened distally. Mesopleura, mesosternum and metapleura light red, in some specimens the shoulder marks also light red, in most specimens the dorsal edges of the mesopleura black. Pterostigma dark brown, the proximal corner paler.

♂. Unknown.

Trematopygodes similator, spec. nov.

Types. Holotype: ♀, "Clifton, O., V.22.42.", "D. J. & J. N. Knull Collrs." (Gainesville). – Paratype: 1♀, Linville Falls, about 4000 ft., N. C., 20.VI., F. Sherman (Gainesville).

Additional Material (not included in the type series). 1♂, Ithaca, N. Y., 24.V.1940, H. & M.Townes (Gainesville).

Description

♀ Holotype: Length of front wings 7.0 mm. Body length 8.7 mm.

Temples somewhat shorter than eyes, not rectricted directly behind eyes (seen from above). Mandibular teeth equal. Clypeus with the apical flaps distinctly protruding, the subapical swelling distinct, but not much extended in ventral direction. Malar space 1.3 times as wide as the distal end of the first flagellar segment. Flagellum with 39 segments, the 4th flagellar segment 1.9-2.1 times as long as wide. Face and frons coriaceous, the former with an additional fine and dense punctation. Temples shining, with a very fine punctation on a slightly coriaceous background. Mesoscutum shining, with a fine punctation on a slightly coriaceous background, the punctures 0.5-1.0 times as wide as their interspaces. Mesopleura shining, slightly coriaceous, outside of the large speculum with a fine and dense punctation, the punctures as wide as or wider than their interspaces. Metapleura with a dense punctation on a smooth background. Tarsal claws strongly pectinate, the subapical teeth almost as long as the apical ones. Dorsal part of propodeum coriaceous, a very fine punctation hardly visible. Area superomedia indicated by a furrow, which is partly bounded by fine carinae. Area petiolaris and the lateral areas distinctly bounded frontally. Petiolus without dorsal carinae or subbasal dorsolateral lobes. First and second tergites of gaster in most parts with a fine and dense punctation on a slightly coriaceous background, the punctures wider than or as wide as their interspaces, the caudal tergites less punctate.

Colour. Light red. Mandibles (except teeth), clypeus, cheeks and malar space, inner and ventral parts of the outer orbits, ventral parts of the scape, pedicel and base of flagellum, dorsal hind corner of pronotum, tegulae and trochanters of the front legs yellowish. Black spots and edges on several parts of the body: eg dorsal parts of the scape, pedicel and base of flagellum, frons and ocellar triangle, frontal parts of pronotum and mesoscutum, edges of mesoscutum, scutellum and propodeum, base of hind coxae, frontal end of petiolus. Pterostigma dark brown, the proximal corner paler.

? ♂: Clypeus without apical flaps. Flagellum with 35 segments, the 4th flagellar segment 2.1 times as long as wide. Mesopleura smooth, outside of the large speculum with a very fine punctation, the punctures about 0.5 times as wide as their interspaces. Punctation of the first and second tergites of gaster less dense. Black and light red markings on head and thorax much contrasted. Central part of frons, ocellar triangle, vertex, dorsal parts of the scape, pedicel and base of flagellum, dorsal part of pronotum, frontal, central and sublateral parts of mesoscutum, dorsal edges of mesopleura and two sublateral spots on mesosternum black. Propodeum completely black. Gaster for the greater part black, postpetiolus, second tergite and the base of the third tergite reddish brown. The association of the male is tentatively.

Trematopygodes townesi, spec. nov.

Types. Holotype: ♀, "Lake Wohlford, Cal., IV.27.74, H. & M. Townes" (Gainesville). – Paratypes: 2♀♀, 1♂, from the same place and collectors (Gainesville); 5♀♀, 11♂♂, Potrero, San Diego Co., Cal., 9.-17.IV.1974, same collectors (Gainesville, 1♀, 1♂, coll. Hinz); 1♀, Julian, Cal., 24.V.1974, same collectors; 1♀, Selma, Ore., 20.V.1978, same collectors; 1♀, Hyatt Reservoir, Ore., 30.VI.1978, same collectors (all Gainesville); 2♂♂, St. Charles, Saginaw Co., Mich., 31.V.1968 and 13.VI.1969, J. G. Truchan (East Lansing).

Description

♀ Holotype: Length of front wing 5.4 mm. Body length 5.6 mm.

Temples almost as long as eyes, not restricted directly behind eyes (seen from above). Lower mandibular tooth somewhat larger than the upper one. Clypeus with the apical flaps distinctly protruding, the subapical swelling distinct, but not much extended in ventral direction. Malar space about as wide as the distal end of the first flagellar segment. Flagellum with 24-27 segments, the 4th segment 2.1-2.5 times as long as wide. Face and frons with a fine and dense punctation, the punctures often wider than their interspaces, the background of the face almost smooth, that of the frons

coriaceous. Temples shining, with a very fine and rather sparse punctation on an almost smooth background. Mesoscutum shining, with a fine punctation on a smooth background, the punctures almost half as wide as their interspaces. Mesopleura smooth, outside of the large speculum with a fine punctation, the punctures 0.3-0.5 times as wide as their interspaces. Metapleura with a fine and rather dense punctation on a smooth background. Tarsal claws not strongly pectinate, the subapical teeth about half as long as the apical ones. Dorsal part of propodeum with a rather dense punctation on a smooth background, partly rugose. Area superomedia indicated by a shallow furrow (variable). Area petiolaris and lateral areas not bounded frontally. Petiolus without dorsal carinae or subbasal dorso-lateral lobes. First and second tergites of gaster with a fine and dense punctation on a almost smooth background, the punctures wider than their interspaces, the caudal tergites less punctate.

Colour. Black. Mandibles (except teeth), apical part of clypeus, ventral half of scape, dorsal and ventral hind corners of pronotum, tegulae and subtegular ridge (not always) yellow. In some specimens parts of the face below the antennal sockets reddish or tinged with red. Ventral half of flagellum yellowish. Front and middle legs yellowish red, hind legs light red, hind coxae black basally (to a variable extent). Gaster red, petiolus and base of postpetiolus (to a variable extent) black. Pterostigma dark brown, the proximal corner paler.

♂. Clypeus without apical flaps. Flagellum with 26-31 segments, the 4th flagellar segment 2.6-3.0 times as long as wide. Head and thorax for the greater part yellow. Central part of frons, ocellar triangle, vertex and the dorsal edges of mesopleura black, the vertex in some specimens partly reddish. Pedicel, flagellum and legs yellowish red, the coxae and trochanters of front and middle legs yellow. Mesoscutum reddish, the edges and two longitudinal lines yellow. Propodeum reddish or black. Gaster red, petiolus and base of postpetiolus (to a variable extent) black.

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36. Cornelsen, D.: Anwälte der Natur – Umweltschutzverbände in Deutschland. – Beck'sche Reihe 440, Beck, München, 1991, 156 S. ISBN 3-460-34032-6.

Die drei großen Verbände in Sachen Naturschutz werden hier vorgestellt unter dem Geleitwort "Die Natur ist uns Menschen auf Gedeih und Verderb ausgeliefert, wir müssen sie vor uns selbst schützen. Dabei helfen uns die Naturschutzverbände, ohne die das Bewußtsein der meisten von uns in Sachen Naturschutz weniger scharf entwickelt wäre". Dieses Bewußtsein zu entwickeln obliegt an sich der Erziehung und damit der Lehre, d.h. dem Staat ebenso wie dem Naturschutz selbst. Die Verbände übernehmen als private Institutionen Aufgaben des Staates und damit auch ehrenamtlich. Bedauerlicherweise ist in der Vergangenheit guter Wille durch schlechte Anleitung (und Ausbildung) vielfach in die falsche Richtung dirigiert worden, Die Anlage von Amphibienlaichgewässern, die ausschließlich die häufigen Arten unterstützen, die in Konkurrenz die seltenen bedrängen zeugen von derartiger biologischer Unkenntnis. Leitsatz muß auch bei diesen Verbänden weiterhin sein: "Nur was man kennt, kann man erfolgreich schützen". Das Kennenlernen muß also Prorität bekommen. Davon ist bei der Vorstellung des BUND – Bund für Umwelt und Naturschutz Deutschland -, dem Naturschutzbund – (heute: NABU, früher Bund für Vogelschutz) und dem WWF – World Wide Fund for Nature, leider wenig die Rede. Hier werden Gründungsgeschichte, Organisation, Ziele, Projekte und Möglichkeiten der Verbesserung vorgestellt. Es fehlen weitere wesentliche Organisationen, z. B. der Landesbund für Vogelschutz etc. Daß der NABU, ursprünglich aktiv nur in den heutigen neuen Bundesländern, bereits in zahlreiche weiteren umweltpolitischen und fachbiologischen Bereiche engagiert ist, fehlt als Hinweis, was aber auch auf das Erscheinungsjahr zurückzuführen ist. Ein Buch der Historie der Naturschutzbestrebungen in Deutschland ohne den dringenden aktuellen politischen Bezug.

E.-G. Burmeister

37. Herkendell, J. & J. Pretzsch: Die Wälder der Erde – Bestandsaufnahme und Perspektiven. – Beck'sche Reihe 1127, Beck München, 1995, 340 S. ISBN 3-406-39227-X.

Die Bedeutung der Wälder für das ökologische Gleichgewicht der Erde ist unumstritten, die objektiven Informationen über ihren Zustand sind jedoch dürftig. Abholzungen in Brasilien führen bei uns Mitteleuropäern zur Hysterie, da Klimaveränderungen gefürchtet werden, eigene Mißstände werden übersehen vor dem glücklichen Hintergrund, daß im humiden Klima die Wälder besser nachwachsen, die im tropischen Raum unwiederbringlich verloren sind. In dem vorliegenden Buch informieren Fachleute über die Verteilung und Funktion der Wälder in den Erdregionen, beschreiben Ausmaß, Trend und Folgen der Waldzerstörung, versuchen eine Ursachen – und Hintergrundanalyse und unterbreiten Lösungsansätze. Letzere bieten nationale wie internationale forstpolitische Konzeptionen zur Erhaltung und Nutzung des Waldes, wobei wirtschaftsorientiert biologische Aspekte unterrepräsentiert sind. Der Anhang bietet eine Fülle schwerpunktmäßig geordneter Anmerkungen und Literaturhinweise. Für Fachleute und Umwelktschutzorganisationen in Sachen Forstpolitik eine besonders nützliche Informationsquelle

E.-G. Burmeister

38. Ständige Arbeitsgruppe der Biosphärenreservate in Deutschland (hrsg.): Biosphärenreservate in Deutschland – Leitlinien für Schutz, Pflege und Entwicklung. – Springer, Berlin, Heidelberg 1995, 377 S. ISBN 10476774 30/3136-543210.

In den Biosphärenreservaten der UNESCO, als Programm unter dem Begriff "Der Mensch und die Biosphäre" (MAB) geführt, steht nicht der konservierende Naturschutz im Vordergrund, sondern vielmehr das Bemühen des wirtschaftenden Menschen, zu einem harmonischen Miteinander von Natur und Mensch zu gelangen. Neben den Anforderungen des Naturschutzes soll hier den ökonomischen, sozialen, kulturellen und ethischen Aspekten Geltung verschafft werden. Die vorliegende Publikation erläutert zunächst die allgemein gültigen Leitlinien für Schutz, Pflege und Entwicklung dieser Gebiete und stellt daran anschließend detailliert die 12 in Deutschland bestehenden Biosphärenreservate vor. Diese repräsentativen Ausschnitte der Natur – und Kulturlandschaft sind Schutzgebiete, in denen jedoch der Mensch nicht ausgegrenzt, sondern direkt einbezogen wird. Der Schutz des Naturhaushaltes sollte hier mit der Entwicklung nachhaltiger Landnutzung verknüpft sein. Letztere kann darum nicht auf Produktionssteigerung sondern auf ökologisch vertretbarem Maß fortschreiten. Für die einzelnen Reservate werden Stand und Merkmale, Ziele und Aufgaben sowie deren Umsetzung jeweils separat vorgestellt. Es handelt sich um eine gelungene Darstellung, auch wenn vielfach biologische Grundlagen zu kurz kommen.

E.-G. Burmeister

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Three species of *Tanytarsus* involved in California midge nuisance problems: descriptions, ecology, and faunal relations

(Insecta, Diptera, Chironomidae)

Martin Spies

Spies, M. (1998): Three species of *Tanytarsus* involved in California midge nuisance problems: descriptions, ecology, and faunal relations (Insecta, Diptera, Chironomidae). – Spixiana **21/3:** 253-270

Tanytarsus challeti, spec. nov. and *T. pelsuei*, spec. nov. are described and diagnosed in the larval, pupal and adult stages. *T. angulatus* Kawai is first reported from the Nearctic region. Its adult male description is emended, the previously unknown adult female, pupa, and larva are described, and diagnoses for all stages are provided. The species' ecologies, nuisance potentials, distributions and systematic relations are discussed. While the closest relatives of *T. challeti*, spec. nov. and *T. pelsuei*, spec. nov. are found in Australia, *T. angulatus* Kawai appears to have originated in the eastern Palaearctic. *Tanytarsus takahashii* Kawai & Sasa is newly recorded from China and North Korea.

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Introduction

Every spring and summer, government agencies in southern California receive numerous complaints from residents and businesses about non-biting "nuisance" midges from local inland water bodies. In the summer of 1992 two agencies in charge of controlling these problems, the Orange County and Greater Los Angeles County Vector Control Districts, initiated a project to identify the Chironomidae involved in the phenomenon. During this study several species of the genus *Tanytarsus* were encountered, three of which are described below. The general results of the nuisance midge project and descriptions of other taxa are to be presented in several further publications currently in press or in preparation by the present author (and collaborators).

Methodology

Specimens were collected with a variety of samplers: an Ekman grab for deeper-lying sediments, an aluminum scoop (described in Anderson et al. 1964) for scraping substrate surfaces in shallow water, Brundin-style drift nets, aerial nets and aspirators. Final instar larvae and pupae were individually reared in the laboratory to obtain reliable life stage associations.

Wherever possible, standard morphological terminology is followed (combined from Sæther 1980, Cranston & Reiss 1983, Coffman 1986, Pinder & Reiss 1986, and Oliver & Dillon 1989). Pupal lamellar setae (= "filamentous" setae, Schlauchborsten) are called "taeniae" after Langton & Armitage (1995).

Two new terms are introduced: 1. "Sensillar pit" denotes a depression ("grubenartige Vertiefung" of Reiss & Fittkau 1971) on the adult male anal point, clearly outlined in dorsal aspect, and usually containing sensillae basiconicae; 2. "Setiger" is used for the distal, setae-bearing part of the adult male superior volsella, distinguishable from the volsellar stem by an abrupt expansion to dorsal and usually also to median.

For each life stage, a table is given allowing direct comparisons of diagnostic characters. The text descriptions give features not listed in the tables, but also repeat those warranting special mention. Meristic data are generally presented in the format: value range (No. of values). If the value distribution is significantly skewed, n is preceded by the median value: x-y (M; n).

Abbreviations of life stages: ex = exuviae, L = larva, P = pupa, ph = pharate adult.

Abbreviations of names and institutions: GLACVCD = Greater Los Angeles County Vector Control District (Santa Fe Springs, California); JES = Prof. James E. Sublette (Tucson, Arizona); OCVCD = Orange County Vector Control District (Garden Grove, California); UCR = University of California at Riverside, Dept. of Entomology; ZSM = Zoologische Staatssammlung München (Munich, Germany).

Tanytarsus challeti, spec. nov.

"*Tanytarsus (Tanytarsus)* n. sp. 57" Whitsel et al., 1963; records and biology.

Etymology. Named after Gilbert L. Challet (last name pronounced as if French), former manager of the Orange County Vector Control District, for initiating and supporting basic taxonomic work, and staying committed in times of economic adversity. When using the species epithet in speaking, the francophone pronunciation should be maintained to keep the name dedication recognizable.

Description

Larva (see tab. 1).

Coloration. Head yellowish to light brown, postoccipital margin darker. Thorax reddish with green reticulation, abdomen pale red, segments II-VII with greenish lateral ridges. In prepupae: red tinges fading, greenish areas increasing.

Head. Labrum with SI combed, SII simple and bladelike, SIII, SIV simple, fine; chaeta media combed, several neighboring chaetae apically feathered. Premandible with 4 darkened teeth (the most proximal small), and with the usual lateral spine. Mandible with 1 dorsal (pale), 1 apical and 3 inner teeth (dark). Antenna (Fig. 4A) with seta at about ⅔ length of segment I; blade shorter than segment II; Lauterborn organs not reaching tip of segment III. Mentum with trifid median and 5 pairs of darker lateral teeth.

Tab. 1. Larval character data for three species of *Tanytarsus.*

Larval (4th instar) character	*challeti* spec. nov.	*pelsuei* spec. nov.	*angulatus* Kawai
Total length [mm]	5-6	4.5-5.5	4-6
Postmentum length [µm]	155-180 (12)	135-155 (6)	150-170 (11)
Postmentum pigmentation	absent	transverse band	median field
Clypeal seta (S3)	simple	simple	simple
Labral seta SI	combed	branched	combed
Labral seta SII	simple	simple	simple
Labral chaetae	some branching	all simple	all simple
Premandibular teeth	dark	dark	light
Antennal pedestal	without spur	without spur	without spur
Antennal ratio	1.4-1.7 (9)	2.0-2.5 (2.4; 4)	1.9-2.3 (2.2; 11)
Antennal seg. I/II (sclerot. sections only)	3.4-4.5 (11)	5.0-5.3 (5)	4.7-6.2 (10)
Antennal seg. III/IV (sclerot. sections only)	1.5-2.1 (2.1; 9)	1.3-1.6 (4)	1.3-1.8 (7)
Lauterborn pedicel + organ/ant. seg. III-V	at most 0.5	about 1.5	1.5-2
Supraanal seta length [µm]	135-235 (200; 11)	70-80 (3)	80-110 (5)
Anal tubules	short, wide	elongate	elongate

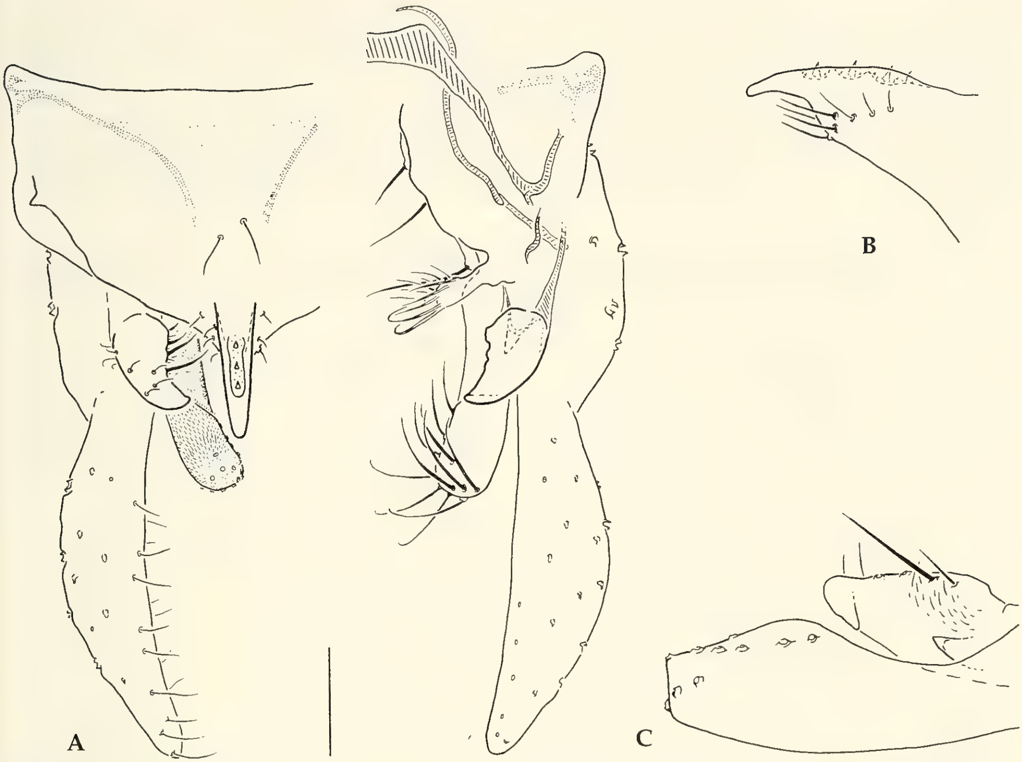

Fig. 1. *Tanytarsus challeti*, spec. nov. Adult male. **A.** Hypopygium, dorsal (scale 50 µm). **B.** Anal point, lateral. **C.** Superior and inferior volsellae, median aspect.

Abdomen. Segments II-VII with lateral longitudinal ridges, the ends of the latter on VII at most slightly bulging to posterior. Procercus low, distally sclerotized, with 6-8 anal setae and 2 short lateral setae. Anal tubules no longer than wide, far shorter than supraanal setae.

Tubes of detritus, often 3-4× length of larva or pupa.

Pupa (see tab. 2).

Coloration. Olive green to brownish. Exuviae with cephalothorax mostly brown incl. wing sheath vein traces; abdominal tergite II with pair of longitudinal pigment patches, TVIII laterally, almost all of TIX brownish.

Head. Cephalic tubercle (CT) prominent, its narrowed apex short (Fig. 5A), at most ¼ length of frontal seta. Antennal pedicel sheath with tubercle at least as long as apex of CT.

Thorax. Median suture anteriorly flanked by at least narrow strips of granules often including some with sharper peaks. Precorneal setae in a row, or a shallow to steep triangle, slanting from anterodorsal to posteroventral. Thoracic horn (Fig. 5B) with sparse chaetae about 3 horn diameters in length lining approximately 2nd and 3rd ⅙ of horn length; chaetae difficult to see if slide-mounted adpressed to horn, occasionally absent. One dorsocentral seta of each unilateral pair often slightly longer and weaker. Prealar mound an elongate, low ridge.

Abdomen. Tergite armament: TII with shagreen reduced to four remnant fields at ends of usual "Π" pattern; hook row spanning about ⅓ of segment width (½ of T); TIII-VI with pairs of longitudinal bands of points set on brown pigment (similar to fig. 5D, but without antero-lateral TIII shagreen), bands limited to anterior halves of tergites, usually longest on IV, shortest on VI, slightly narrower on III; TVIII, IX with small anterolateral shagreen patches. Sternite armament: SI, II with extensive fine shagreen, SVIII with antero-lateral shagreen. Dorsal setae I-II: 2; III-VII: 5; VIII: 1 (postero-lateral);

O-setae: 1 pair each on II-VII; sensillae campaniformes absent. Lateral setae I: 0; II-V: 3; VI: 2 regular setae + 1 posterior taenia (rarely reduced to long, non-taeniate); VII: 2-3 regular + 1-2 taeniae; VIII: normally 5 (occasionally only 4) taeniae with $L_{2,3}$ displaced toward median, 1-2 setae may be reduced to regular. Ventral setae I: 0; II: 3; III-VII: 4; VIII: 1 central pair, non-taeniate. PsA absent. PsB weak, rarely prominent. Anal comb with 4-9 marginal teeth, ventral surface ("disc") relatively small, with 2-7 sometimes minute spines. Anal lobe fringe often with the most anterior setae much shorter, semi-spinose.

Adult male (see tab. 3).

Coloration. Thorax mostly brown, vittae slightly darker but little contrasting, scutellum and weakly sclerotized areas greenish; abdomen with terga brown, otherwise greenish. Wing squama with a dark spot.

Head. Eye extension reaching little more to median than ventral end of eye, with median marginal contour indistinct, grading into microtrichiose frons. Frontal tubercles digitiform.

Thorax. Anteepronotum only on 1 specimen with 1 lateral seta. Scutellum usually with three discrete groups of setae, the median group set slightly more posterior.

Wing. Membrane setae almost always limited to distal portions of cells r_{4+5} and m_{1+2}; cells m_{3+4} and cu_1 with 2-3 setae in only 1 and 2 of 12 specimens, respectively. Anal lobe not prominent.

Legs. Segment lengths as percentage proportions of the respective tibia (n=4):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	132-138	100	166-179	75-82	67-74	52-56	24-27
P_2	111-120	100	51- 60	30-34	26-30	18-21	13-14
P_3	95-100	100	64- 67	39-40	35-36	22-24	12-14

Tibial spur length increasing from P_1 to P_3, on P_2 and P_3 one spur slightly longer than the other; mid and hind tibial combs separate, fully developed.

Hypopygium (Fig. 1). Anal tergite bands separate, usually ending far anterior of anal point origins. T IX with 0-3 (13 of 17 specimens: 2) dorsomedian and 8-15 distal setae; lateral tooth very variable: absent, simple, apically bifid, or double, up to 20 µm long. Anal point with more or less narrowed, rounded apex; sensillar pit always present but of limited extent, with 1-4 (M=3; 16 of 18 with at least 2) sensillae basiconicae surrounded by sparse microtrichia in more extensive pits; no anal point crests

Tab. 2. Pupal character data for three species of *Tanytarsus.*

Pupal character	*challeti* spec. nov.	*pelsuei* spec. nov.	*angulatus* Kawai
Total length [mm]	4.1-5.2 (10)	3.4-4.6 (4)	3.0-4.8 (12)
Frontal seta length [µm]	90-120 (6)	90-100 (2)	80-150 (125; 7)
Cephalic tubercle, apex length [µm]	15-35 (6)	45-70 (4)	25-50 (6)
Pedicel sheath tubercle length [µm]	35-40 (4)	10-20 (4)	max. 15 (8)
Thoracic horn length [µm]	350-600 (5)	330-375 (4)	225-450 (10)
Thoracic horn surface	with 0-12 chaetae	with 0-9 chaetae	bare
Median antepronotal setae	1	1	1
Lateral antepronotal setae	1 seta, 1 sensilla	1 seta, 1 sensilla	1 seta, 1 sensilla
Precorneal setae, arrangement	variable	in slanted row	in slanted row
Precorneal setae, size	(Pc_2+) Pc_3 smaller	$Pc_1 > Pc_2 > Pc_3$	Pc_1 stronger
Dorsocentral setae	subequal to inequal	$Dc_4 > Dc_3 > Dc_{1,2}$	Dc_3 weaker
Wing sheath nose	absent, rarely very low	present, rarely low	often low, rarely absent
Abdom. seg. VIII ventral seta	not enlarged	strong to taeniate	taeniate
Abdom. seg. VIII dorsal seta	1, not enlarged	2; 1 strong	1, strong
Abdom. seg. V-VIII lateral taeniae	0/(0)1/(1)2/(3-)5	0/0-1/2/5	(0)1/(0)1/(1)2/5
Anal lobe taeniae, dorsal	2	2	2
Anal lobe taeniae, fringe	30-45 (9)	35-40 (4)	43-54 (13)

evident (compare figs 1B and 3B). Superior volsella (Figs 1A, C) with setiger in lateral view strongly, in dorsal aspect at most moderately narrowing, apex with a ventromedian lip or hook; setiger bearing extensive medio-proximal field of microtrichia varying in length, 2-5 median setae (usually 3, the distal 2 stronger), and 7-10 small dorsal to lateral setae; digitus a conical stub not visible from dorsal, 12-24 % of setiger length. Inferior volsella densely microtrichiose, distally with ridge-like expansion to dorsal (Fig. 1C), and median to caudal setae. Median volsella with stem shorter than setiger of superior volsella, distally setose, with 2-3 lamellate setae of spatulate type (Sæther 1980: fig. 23). Gonostylus moderately widened in midsection, apex rather blunt.

Adult female.

Similar to male except as listed in tab. 4. Genitalia: indistinguishable from other *Tanytarsus* females studied.

Systematics. In the preliminary scheme of Holarctic *Tanytarsus* species groups based on pupal and male adult morphologies (Pinder & Reiss 1986, Cranston et al. 1989), *T. challeti*, spec. nov. and the highly similar *pelsuei*, spec. nov. best fit with the *mendax* group. However, after global-level comparisons of published descriptions and specimens held at ZSM, the new species are considered most

Tab. 3. Adult male character data for three species of *Tanytarsus.*

Adult male character	*challeti* spec. nov.	*pelsuei* spec. nov.	*angulatus* Kawai (USA)	*angulatus* Kawai (Japan) [A, B]
Wing length [mm]	1.85-2.50 (17)	1.72-2.16 (12)	1.72-2.40 (8)	1.48-1.98
Temporal setae	13-22 in 1-2 rows	10-16 in 1-2 rows	11-15 in 1 row	10-13
Frontal tubercles [LxW in µm]	19-31 x 7-8	22-43 x 7-15	38-56 x 8-14	A: 60 x 15
Antennal ratio (13 flagellomeres)	0.99-1.16 (17)	1.18-1.45 (13)	1.13-1.39 (10)	1.10-1.36
Clypeus setae	23-45 (11)	18-29 (11)	17-27 (9)	10-21
Palpomere lengths 2-5 [µm]	30-40	35-40	35-50	A: 33, 35
	85-105	105-120	125-155	A: 108, 135
	95-110	120-140	125-155	A: 110, 135
	140-180	195-225	210-235	A: 234, 235
Scutal tubercle	absent	absent	absent	–
Antepronotal setae	0-1	0	0	0
Acrostichal setae	9-19 (15)	10-17 (12)	13-19 (10)	9-15
Dorsocentral setae	7-14 (26)	8-13 (16)	7-13 (10)	8-12
Prealar setae	1-3 (1; 17)	1-2 (13)	1 (9)	1-2
Supraalar setae	0	0	0	0
Scutellar setae	4-9 (6; 16)	6-9 (7; 13)	6-9 (6; 9)	6-8
Wing VR	1.05-1.08 (3)	1.08-1.16 (5)	1.12-1.15 (3)	A: 1.09-1.15
Wing vein setae: R	19-23 (6)	19, 20	28-33 (3)	A: 25, 31
R_1	4-17 (6)	13, 19	24-28 (3)	A: 21, 23
R_{4+5}, dorsal	11-21 (6)	18, 22	26-34 (3)	A: 33 (2)
R_{4+5}, ventral	3-8 (6)	3 (2)	9-12 (3)	–
M	0 (6)	0 (2)	0 (3)	A: 0 (2)
M_{1+2}	11-20 (5)	33, 47	57-58 (3)	A: 42 (2)
M_{3+4}	0-3 (2)	19, 22	30-35 (3)	A: 21, 28
Cu_1	0 (6)	17, 18	17-22 (3)	A: 16, 18
An	0 (6)	23, 25	26-31 (3)	A: 31, 33
Beard BR (setae on ta_{1-3})	5-8.5	≥6	4-5	2.5-4.3
Leg ratio LR_1	1.66-1.80 (18)	2.02-2.33 (10)	2.04-2.29 (4)	2.28-2.64
LR_2	0.51-0.60 (5)	0.59-0.63 (4)	0.58-0.62 (6)	0.53-0.64
LR_3	0.64-0.67 (6)	0.65-0.67 (4)	0.62-0.66 (6)	0.65-0.71
Mid ta_1 sensillae chaeticae	3-10 (18)	4-9 (11)	4-7 (7)	A: 3-4
Pulvilli	present	present	present	present

A Entries beginning with "A:" are author's own observations on holotype and three paratypes.
B Unmarked data are quoted from Kawai (1991).

closely related to the Australian *T. semibarbitarsus* Glover and *barbitarsis* Freeman, of the *fuscithorax* group (Glover 1973). The latter are not only similar morphologically, but also ecologically, with the potential for abundant development under both eutrophic and elevated salinity conditions (e.g., Kokkinn 1986).

The data available on members of the *mendax* and *fuscithorax* species groups strongly suggest close phylogenetic relations (including possible synonymies), but a full revision is required to evaluate this hypothesis.

Differential diagnoses

The larva of *Tanytarsus challeti*, spec. nov. can be identified by the combination of characters given in tab. 1. *T. barbitarsis* Freeman, while carrying similar short Lauterborn organ stalks and anal tubules, could not be directly compared in the present study, but possibly differs by the mentum having 4 instead of 2 notches in the median tooth, and outermost teeth directed to sublateral (Kokkinn 1986).

Tab. 4. Adult female character data for three species of *Tanytarsus*.

Adult female character	*challeti* spec. nov.	*pelsuei* spec. nov.	*angulatus* Kawai (USA only)
Wing length [mm]	2.18-2.44 (2.20; 6)	1.55, 2.12	1.70, 1.72
Temporal setae	10-22 in 1(-2) rows	8-12 in 1 row	10-12 in 1 row
Frontal tubercles [LxW in µm]	10-25 x 6-8	15-30 x 8-15	20-22 x 8-10
Antennal ratio (4 flagellomeres)	0.70-0.86 (6)	0.57-0.73 (4)	0.64 (2)
Clypeus setae	35-61 (42; 6)	26-30 (4)	21, 24
Palpomere lengths 2-5 [µm]	30-40	35-40	30, 40
	90-95	95-110	110, 125
	100-120	115-125	130 (1)
	150-185	195, 200	?
Acrostichal setae	9-15 (13; 6)	12-20 (4)	13, 14
Dorsocentral setae	9-17 (6)	11-15 (4)	7-11 (2)
Humeral setae	2-4 (6)	2-4 (4)	2-4 (2)
Prealar setae	1-3 (1; 5)	1 (4)	1-2 (2)
Scutellar setae	6-10 (6)	6-10 (4)	8, 9
Wing VR	1.08-1.14 (6)	1.16, 1.06	1.21 (1)
Wing vein setae: R	23-31 (6)	26, 27	25 (1)
R_1	22-31 (6)	28, 31	25 (1)
R_{4+5} , dorsal	35-51 (39; 6)	35, 36	57 (1)
R_{4+5} , ventral	21-32 (5)	59, 55	20 (1)
M	0-8 (0; 6)	10, 8	0 (1)
M_{1+2}	44-59 (55; 6)	70, 65	85 (1)
M_{3+4}	24-35 (32; 6)	38, 41	43 (1)
Cu	4-22 (10; 6)	29, 26	25 (1)
Cu_1	6-11 (6)	22, 23	21 (1)
An	6-25 (6)	34, 25	30 (1)
Leg ratio LR_1	1.58-1.70 (1.59; 5)	2.23, 1.80	2.17, 2.22
LR_2	0.51-0.56 (6)	0.57, 0.56	0.55 (1)
LR_3	0.63-0.68 (0.63; 6)	0.66, 0.62	0.63 (1)
Mid ta_1 sensillae chaeticae	35-43 (9)	40-51 (4)	18, 26
Sternite VIII setae, transverse	38-50 (40; 6)	30-40 (4)	33, 34
SVIII setae, at vaginal bay	1-3 ea. side	1-4 (4)	3-6 (3; 2)
Notum length [µm]	90-135 (6)	85-100 (3)	75, 85
Seminal capsule length [µm]	55-70 (4)	50, 60	75 (1)
Spermathecal duct, course	straight	winding (?)	?
Spermathecal duct, width [µm]	5-6 (5)	4, 5	?
Gonocoxite IX setae	5-10 (6)	4-8 (4; 4)	5-8 (2)
Tergite IX setae	35-50 (6)	20-32 (4)	22, 26
Cercus length [µm]	100-110 (5)	70-90 (3)	70 (1)

Among other pupae with the "*mendax* group" character pattern – elongate cephalic tubercles, thoracic horn with a partial fringe of long chaetae, abdominal tergites with armament patches of points only, penultimate segment with 5 lateral taeniae – *T. challeti*, spec. nov. is most similar to *T. pelsuei*, spec. nov. and *mendax* Kieffer (Langton 1991). The combination of a cephalic tubercle with a narrowed end at most as long as the pedicel sheath tubercle, vestigial wing sheath nose, absence of antero-lateral shagreen on abdominal tergite III, and only one dorsal seta in the postero-lateral corner of TVIII is unique to *challeti*, spec. nov.. Pupae of Australian *fuscithorax* group members (*fuscithorax* Skuse, *semibarbitarsus* Glover) most strikingly differ by much longer cephalic tubercles, and by the abdominal point patches continuing posteriorly as longitudinal shagreen on at least some tergites (Cranston 1996).

Adult males of *T. challeti* can be distinguished from nearly all congeneric species on hypopygial features alone. The combination of the sensillae basiconicae being concentrated in a discrete pit of limited extent on the anal point surface, a superior volsella with an apical, ventro-median lip or hook on the setiger, and a short digitus, is only matched by *T. pelsuei*, spec. nov., the Australian *T. barbitarsis* Freeman and *semibarbitarsus* Glover (Glover 1973), and the Afrotropical to Mediterranean *T. horni* Goetghebuer. *T. challeti*, spec. nov. differs from *barbitarsis* by the lower antennal ratio at comparable body sizes, the tibial combs showing no signs of reduction, the much more extensive wing setation, and a narrower anal point. From *semibarbitarsus* and *pelsuei*, spec. nov., *T. challeti*, spec. nov. can be separated by consistently lower antennal and fore leg ratios at comparable body sizes, the slightly shortened palpomere 5, and the anal point contour originating far posteriorly. In addition, *pelsuei*, spec. nov. has a much more extensively setose wing (see Table 3). *T. semibarbitarsus*, on the other hand, carries conspicuously longer distal setae on the median volsella. *T. horni* has a wider anal point, lateral rather than median microtrichia on the setiger, and apically acute median volsellar setae of foliate, not spatulate type (compare Sæther 1980: figs 22, 23).

Female adults of *T. challeti*, spec. nov. in the California nuisance study could be identified only by the wing setation: while all other species display female wings well haired nearly to the arculus, in *challeti*, spec. nov. cell an is the only one with setae in the proximal wing half. The number of setae on vein Cu_1 also appears significantly lower. Beyond the local level, a positive identification of *challeti* females is not possible without associated specimens of another life stage.

Types. Holotype: 1 individually associated Lex+Pex+adult ♂ (on 1 slide, in Euparal), USA, California, Orange County, Huntington Beach, Talbert Channel at Adams Avenue, 21.IV.1993, leg. M. Spies, deposited at Snow Entomological Museum, University of Kansas, Lawrence, Kansas, USA.

Paratypes (all slide-mounted in Euparal; from USA, California): **A.** Los Angeles Co., Los Angeles, leg. M. Spies, at GLACVCD unless otherwise specified: 3 Lex+Pex+ph♀ (on 1 slide), 1 Lex+P+ph♂, 1 Pex+♂ (at ZSM), Ballona Creek betw. Marina Fwy. & Lincoln Blvd., 28.VI.1993; 1♂, Ballona Creek near Rosy Circle homes, 28.VI.1993. – **B.** Los Angeles Co., leg. M. S. Mulla, J. Chaney & M. Breidenbaugh, at UCR: 1♂, 1♀, Marina del Rey, Centinela Creek W of Centinela Av., 21.V.1997; 2 L, Marina del Rey, Ballona Creek at confluence of Centinela Creek, 27.V.1997; 1♂, Marina del Rey, Ballona Creek W of Centinela Av., 4.VI.1997; 1♀, as previous, but 17.VI.1997; 1♂, Marina del Rey, near Sanford St. homes, 17.VI.1997; 2♂♂, 1♀, West Los Angeles, Ballona Creek near Hwy. 90, 5.VIII.1997. – **C.** Orange Co., Huntington Beach; unless otherwise specified: leg. M. Spies, at OCVCD: 2 L, 1 Pex, 1 Pex+ph♂ (all on 1 slide), 1 Lex+Pex+♂, Fountain Valley Channel at Bushard St., 9.VI.1993; 3♂♂, 1♀, Talbert Channel at Yorktown Av., 18.IX.1992; 1 Pex+ph♂, 1 Pex+♂, as previous, but 9.VI.1993; 1 Pex+ph♂, 1 Pex+♂, Talbert Channel at Girls & Boys Club, 9.VI.1993; 1 Lex+Pex+♀, 1 Pex+♂, 3 Lex+Pex+♂ (1 in coll. JES, 1 at ZSM), all data as holotype; 1 Lex+Pex+♂, as previous, but 9.VI.1993; 1♂, from light trap at Springdale St. & Littlefield Dr., 7.-13.IV.1993, leg. OCVCD.

Further records (USA, California): San Mateo Co.: Hillsborough, 27.X.1959 (JES, pers. comm.); San Mateo, Seal Slough (Whitsel et al. 1963); East Palo Alto, sump, 19.XI.1959, leg. R. Whitsel (JES); as previous, but golf course, 13.X. and 19.XI.1959 (JES); as previous, but pond next to golf course, 1960-1961 (Whitsel et al. 1963). Solano Co.: Lake Dalwigk near Vallejo, 2.XI.1960 (Whitsel et al. 1963); as previous, but 19.IV.1962, leg. G. Grodhaus (JES). Los Angeles Co.: Venice, residence at 37th St. and Carol Ct., 12.VII.1961, leg. D. H. Roke (JES).

Distribution and ecology. *Tanytarsus challeti*, spec. nov. has been found in near-coastal central and southern California, exclusively in habitats characterized by at least periodically elevated salinity levels (Whitsel et al. 1963: specific gravity 1.001-1.016, water temperature 6-26 °C; author's records: salinity 0.8-3.0 ‰, specific conductance 1730-5000 µS/cm, water temperature up to 34 °C). Since in non-turbulent situations saline water can form separate layers underneath freshwater, the open-water

measurements given may underestimate the species' actual salinity tolerance.

Whitsel et al. (1963: 91) found *T. challeti*, spec. nov. to be widespread in suitable lentic environments, and report high densities ("over 1000 fourth instar larvae per square foot") from soft sediment surfaces or around bases of aquatic macrophytes. The larvae are said to feed on algae, and to tolerate low dissolved oxygen concentrations. In the Los Angeles area the species was encountered in flood control channels, but only in very low flow conditions. Substrates consisted of mud, detritus and algae, occasionally among reed beds.

Adult emergence evidently takes place continuously throughout the warmer seasons (at least from April through early November), and unsynchronized multivoltine patterns may be inferred.

Due to its propensity to develop highly dense populations, but only in habitats of limited local distribution, *T. challeti*, spec. nov. has been assigned intermediate nuisance status in southern California.

Tanytarsus pelsuei, spec. nov.

"*Tanytarsus (Tanytarsus)* n. sp. 3" Darby, 1962; adult male in key, records.

"*Calopsectra* n.sp. 2" Frommer & Sublette, 1971; record.

"*Tanytarsus* sp. fitting the description of Darby's *Tanytarsus* n. sp. 3 (Darby 1962)" Norland & Mulla, 1975; chemical control.

"*Tanytarsus* n. sp. 3 after Sublette (Darby 1962)" Ali & Mulla, 1976; chemical control. Under same name: Ali et al. (1978), chemical control; Ali & Mulla (1979a), distribution and control; Ali & Mulla (1979b), emergence pattern.

"*Tanytarsus (Calopsectra)* new species 8" (partim); Sublette, 1979; ecology, distribution, larval karyotype.

Etymology. Named after Frank W. Pelsue, former manager of the Greater Los Angeles County Vector Control District (then Southeast Mosquito Abatement District), for his commitment to support basic taxonomic work, even in times of economic adversity. In pronouncing the species epithet, the "e" should be silent in order to keep the name dedication recognizable.

Description

Larva (see tab. 1).

Coloration. Head yellowish to light brown anteriorly, posterior ⅓ to ½ dark brown ventrally and laterally, frontoclypeus often darkened. Thorax reticulate green, yellow and red (all pale); abdomen pale red to orange, segments II-VII with greenish lateral ridges. In prepupae: red tinges fading, green and yellowish areas increasing.

Head. Labral seta SI with 0-3 median branches (Fig. 4C), SII simple and bladelike, SIII, SIV simple, fine; all long chaetae simple. Premandible with 4 darkened teeth (the most proximal small), and with the usual lateral spine. Mandible with 1 dorsal (pale), 1 apical and 3 inner teeth (dark). Antenna (Fig. 4B) with position of seta variable between about 0.5 and 0.75 of segment I length; blade length subequal to sclerotized section of segment II. Mentum with lateral parts of trifid median as dark as 5 pairs of lateral teeth, the middle part lighter.

Abdomen. Segments II-VII with lateral longitudinal ridges, the ends of the latter on VII at most slightly bulging to posterior. Procercus low, distally sclerotized, with 6-8 anal setae and 2 short lateral setae. Anal tubules normally developed, longer than supraanal setae.

Tubes of detritus.

Pupa (see tab. 2).

Coloration. Greenish, cephalothorax darker. Exuviae with cephalothorax mostly brown incl. wing sheath vein traces; abdominal tergite II with longitudinal grayish-brown pigment patches (faint on some specimens), TVIII laterally, almost all of TIX brownish.

Head. Cephalic tubercle (CT) prominent, its narrowed apex elongate (Fig. 5C), at least ½ length of frontal seta. Antennal pedicel sheath with tubercle at most ½ as long as apex of CT.

Thorax. Median suture flanked by at most very few granules. Thoracic horn with sparse chaetae lining approximately 2^{nd} ¼ of horn length (similar to fig. 5B); chaetae about 3 horn diameters long, difficult to see if slide-mounted adpressed to horn. Prealar mound at most a very low ridge.

Abdomen. Tergite armament: TII with extensive shagreen in "Π" pattern, transverse section extending

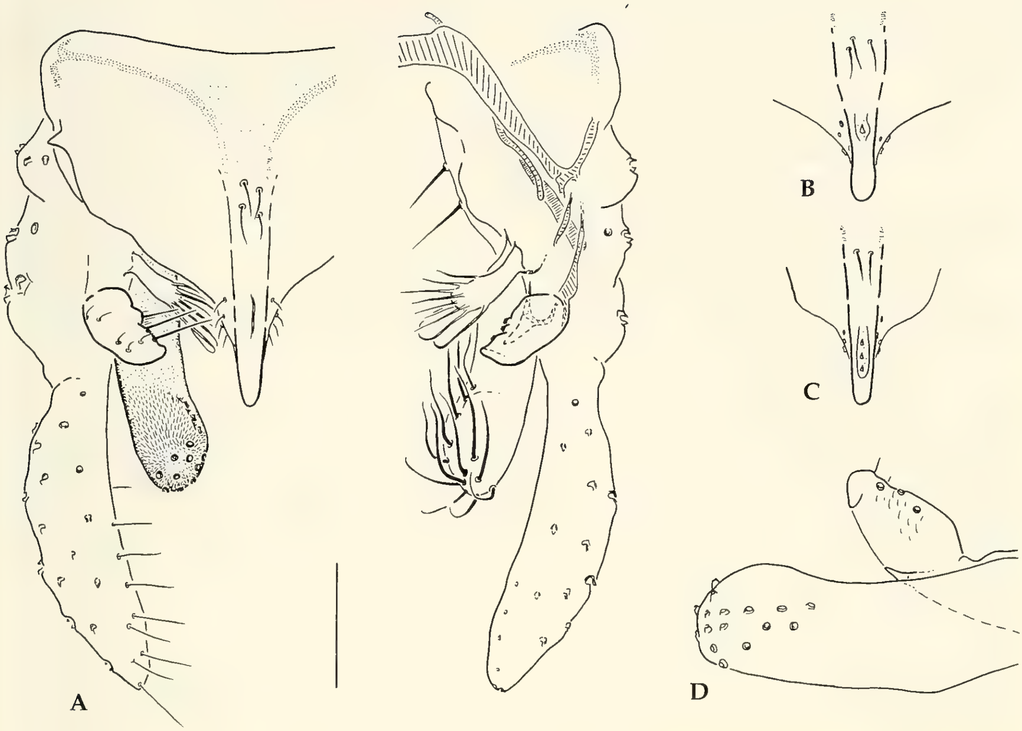

Fig. 2. *Tanytarsus pelsuei*, spec. nov. Adult male. **A.** Hypopygium, dorsal (scale 50 µm). **B, C.** Anal point variations, dorsal. **D.** Superior and inferior volsellae, median aspect.

to anterior tergite corners, and including a pair of submedian areas with slightly enlarged points; hook row spanning about ⅓ of segment width (½ of T); TIII-VI (Fig. 5D) with pairs of longitudinal bands of points set on gray pigment, TIII bands connected to antero-lateral shagreen patches, longer bands reaching to about mid-tergite, often shorter on VI; TVIII with small round, TIX with transverse anterolateral shagreen patches. Sternite armament: SI, II with extensive fine shagreen, SVIII with antero-lateral shagreen. Dorsal setae I-II: 3; III-VII: 5; VIII: 2 (the postero-lateral strong); O-setae: 1 pair each on II-VII; sensillae campaniformes: 1 central and 1 posterior pair on II, III. Lateral setae I: 0; II-V: 3; VI: 2 regular setae + 1 posterior taenia (rarely reduced to long, non-taeniate); VII: 2 regular + 2 taeniae; VIII: 5 taeniae with $L_{2,3}$ displaced toward median. Ventral setae I: 0; II: 3; III-VII: 4; VIII: 1 central pair, semi-taeniate. PsA absent. PsB weak, rarely prominent. Anal comb with 5-6 marginal teeth, ventral surface ("disc") relatively small, number and size of disc spines highly variable.

Adult male (see tab. 3).

Coloration. Mostly greenish, thoracic vittae, median anepisternum II, preepisternum (except dorsal margins), and postnotum (except anterior margin) brown. Wing squama with a dark spot.

Head. Eye extension reaching little more to median than ventral end of eye, with median marginal contour indistinct, grading into microtrichiose frons. Frontal tubercles digitiform.

Thorax. Scutellum usually with three discrete groups of setae, the median group set slightly more posterior.

Wing. Membrane setae reaching level of RM in cells r_{4+5} and m_{1+2}, setae also present in m_{3+4}. Anal lobe not prominent.

Legs. Segment lengths as percentage proportions of the respective tibia (n=4):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	168-179	100	202-233	93-105	84-94	66-76	30-34
P_2	121-124	100	59- 63	32- 33	25-27	17-19	12-14
P_3	98-101	100	65- 67	38- 40	35-37	22-24	12-13

Tibial spur length increasing from P_1 to P_3, on P_2 and P_3 one spur slightly longer than the other; mid and hind tibial combs separate, fully developed.

Hypopygium (Fig. 2). Anal tergite bands separate, their ends almost touched by the far anterior anal point origins. T IX with 2-4 (7 of 12 specimens: 2) dorsomedian and 11-14 distal setae; lateral tooth simple, or absent. Anal point fairly wide, with rounded apex; sensillar pit absent (10 of 15 specimens) or present; if absent, rudimentary contour often visible in dorsal view (Fig. 2A); if present, pit floor of limited extent (Figs 2B, C), with 1-3 sensillae basiconicae surrounded by sparse microtrichia in more extensive pits; no anal point crests evident. Superior volsella (Figs 2A, D) with distal half of setiger in lateral view strongly, in dorsal aspect at most moderately narrowing, apex with a ventromedian lip or hook; setiger bearing median microtrichia varying in length, 2-4 median setae (usually 3: the distal 2 stronger), and 5-8 small dorsal to lateral setae; digitus short, 30-43 % of setiger length. Inferior volsella densely microtrichiose and with median to caudal setae, distally with expansion to dorsal. Median volsella with stem shorter than setiger of superior volsella, distally setose, with 2-3 lamellate setae of spatulate type (Sæther 1980: fig. 23). Gonostylus with moderate widening in midsection, apex rather blunt.

Adult female.

Similar to male except as listed in tab. 4. Genitalia: practically indistinguishable from other *Tanytarsus* females studied. The winding spermathecal duct listed in tab. 4 may be a preparation artefact.

Systematics. See corresponding section under *T. challeti*, spec. nov.

Differential diagnoses

The larva of *Tanytarsus pelsuei*, spec. nov. can be identified by the combination of characters given in tab. 1, especially the unusual labral seta SI. *T. fuscithorax* Skuse and *semibarbitarsus* Glover could not be directly compared in the present study, but differ at least by significantly shorter Lauterborn organ stalks (Cranston 1996, Kokkinn 1986).

Among other pupae with the "*mendax* group" character pattern (see diff. diagnoses for *T. challeti*, spec. nov.) *T. pelsuei*, spec. nov. is most similar to *T. mendax* Kieffer and *T. challeti*, spec. now. The longer apex of the cephalic tubercle, presence of a wing sheath nose, of antero-lateral shagreen on abdominal tergite III, and 2 dorsal setae in the postero-lateral corner of TVIII distinguish *T. pelsuei*, spec. nov. from *T. challeti*, spec. nov.. Pupae of *T. mendax* and *T. pelsuei*, spec. nov. are at present only tentatively separable by relative thoracic horn length: California *mendax* Pex = 4-6.5 mm, thor. horn = 600-850 µm; *pelsuei* Pex = 3.5-4.5 mm, thor. horn = 330-375 µm. Pupae of Australian *fuscithorax* group members (*fuscithorax* Skuse, *semibarbitarsus* Glover) most strikingly differ by much longer cephalic tubercles, and by the abdominal point patches continuing posteriorly as longitudinal shagreen on at least some tergites (Cranston 1996).

Adult males of *T. pelsuei* can be distinguished from nearly all congeneric species on hypopygial features alone. The combination of the sensillae basiconicae being concentrated in a discrete pit of limited extent on the anal point surface (with reduction tendencies leading to complete absence of pit and/or sensillae), a superior volsella with an apical, ventro-median lip or hook on the setiger, and a short digitus, is only matched by *T. challeti*, spec. nov., the Australian *T. barbitarsis* Freeman and *semibarbitarsus* Glover (Glover 1973), and the Afrotropical to Mediterrranean *T. horni* Goetghebuer. *T. pelsuei*, spec. nov. differs from *challeti*, spec. nov. (compare tab. 3) by consistently higher antennal and fore leg ratios at comparable body sizes, palpomere 5 showing no signs of reduction, a much more extensively setose wing, and the anal point origins reaching far anterior. From *barbitarsis* Freeman, *T. pelsuei*, spec. nov. may be distinguished by the tibial combs showing no signs of reduction, the much more extensive wing setation, by the (usual) presence of dorsomedian TIX setae, and a narrower anal

point. *T. semibarbitarsus* differs by lacking dorsomedian TIX setae, and by carrying conspicuously longer distal setae on the median volsella. *T. horni* has a wider anal point, lateral rather than median microtrichia on the setiger, and apically acute median volsellar setae of foliate, not spatulate type (compare Sæther 1980: figs 22, 23).

Unassociated female adults of *T. pelsuei*, spec. nov. could not be identified against other species (in the study area: *angulatus* Kawai, *dendyi* Sublette) with any of the characters examined.

Types. Holotype: adult ♂ (on slide, in Euparal), USA, California, Orange County, Anaheim, Kraemer Flood Control Basin, 29.IV.1993, leg. M. Spies, deposited at Snow Entomological Museum, University of Kansas, Lawrence, Kansas, USA.

Paratypes (all USA): **A.** California, Los Angeles Co., Los Angeles, leg. M. Spies, at GLACVCD unless otherwise specified: 1 Pex+ph♂ (on 1 slide with 2 Pex+ph♂ of *Tanytarsus mendax* Kieffer), Pico Rivera, San Gabriel Coastal Spreading Basin #3, 13.IV.1993; 1 Pex+♀, 3♂♂, Pico Rivera, San Gabriel River at Washington Blvd., 13.IV.1993. – **B.** California, Orange Co.; unless otherwise specified: leg. M. Spies, at OCVCD: 3 L (on 1 slide, together with 1 L of *Tanytarsus* sp. indet.), La Mirada, Coyote Creek at Hillsborough Dr., 15.VI.1993; 1 Pex+♀, 1 Lex+Pex+ph♀, Anaheim, Anaheim Lake, 19.III.1993; 2♂♂, Anaheim, Miller Flood Control Basin, 29.IV.1993; 1♂, all data as holotype; 1 Lex+Pex+♀, 1 Pex+ph♂, 1 L (on 1 slide with 3 L of other spp.), Anaheim, Santa Ana River at Glassell St., 16.IX.1992; 1♂, Anaheim, Santa Ana River at Lincoln Av., 17.V.1993; 1♂, Anaheim, Santa Ana River Flood Control Basin N of Ball Rd., 9.XI.1992; 2♂♂ (at ZSM), Anaheim, Bedford Circle homes, 29.IV.1993. – **C.** Miscellaneous, in coll. F. Reiss: 1♂, California, Riverside Co., Rancho Mirage, Wilshire Palms Country Club, IV.1980, leg. F. Bachmaier; 1♂, New Mexico, Grant Co., Gila River at Hwy. 180 W of Silver City, 7.VIII.1980, leg. F. Reiss.

Further records (all USA). **A.** California: Butte Co.: Thermalito Forebay 2 mi. W of Oroville, 18.VI.1969, leg. G. Grodhaus (JES, pers. comm.). Yolo Co., rice fields near Davis, 2-13.VII.1956 and 29.VIII.1958 (Darby 1962); Davis, 1.VI.1974, leg. S. L. Clement (JES). Sacramento Co.: rice fields near Rio Linda, 17.VIII.1957, 11.IX.1957, 24.VI.1958, 4.VII.1958, 10.VII.1958 (Darby 1962). Fresno Co.: 6 mi. W of Firebaugh, 8.V.1962, leg. D. E. Reed (JES). Inyo Co.: Death Valley Natl. Monumt., Furnace Creek, 31.III.1951, leg. R. L. Usinger (JES). Los Angeles Co.: Pico Rivera, San Gabriel River at Washington Blvd., 24.VI.1993, leg. M. Spies; Pico Rivera, Rio Hondo and spreading basins, VII-X.1960, leg. E. C. Bay (JES); as previous, but 24.VI.1993, leg. M. Spies; Whittier, Rio Hondo, I-II.1960, leg. L. D. Anderson (JES); as previous, but X.1960, leg. S. I. Frommer (JES). Orange Co.: Buena Park, Coyote Creek at Tulare St., 5.X.1992, leg. M. Spies; Anaheim, Atwood Channel between Rose Dr. & Miller St., 19.III.1993, leg. M. Spies; Anaheim, Santa Ana River channel and basins, IV.-X.1975 (Ali & Mulla 1976); Anaheim, Santa Ana River E of 91 Fwy., 17.V.1993, leg. M. Spies; Anaheim, Santa Ana River Flood Control Basin S of Lincoln Av., 5.XI.1992, leg. M. Spies; Placentia, intersection of Chapman & Orangethorpe Aves., 16.III.1993, leg. D. D. Loughner; as previous, but San Miguel Circle homes, 17.III.1993; Laguna Cyn., 7.I.1964, leg. M. E. Drurie (JES). Riverside Co.: Corona, Village Grove Lake, IV.1977-IV.1978 (Ali et al. 1978); Mira Loma, Swan Lake, 11.II.1963, leg. L. D. Anderson (JES); Lake Elsinore, VII-VIII.1969 (JES); Riverside, 14.IX.1962, leg. S. I. Frommer (JES); Palm Desert, 22.V.1970 (JES); Deep Canyon near Palm Desert, VI.1964 (Frommer & Sublette 1971); as previous, but V-VI.1970 (JES); Indio, 15. and 22.V.1970 (JES); Coachella, 15.V.1970 (JES); Thermal, 22.V.1970 (JES); Mecca, 8. and 22.V.1970 (JES); experimental ponds near NW corner of Salton Sea, XII.1972-IV.1973 (Norland & Mulla 1975). – **B.** Colorado: Archuleta Co.: Navajo River nr. New Mexico state line, 7.X.1974 (JES). – **C.** New Mexico (all JES): Colfax Co.: Canadian River at Taylor Springs, 6.IX.1974. Santa Fe Co.: Rio Grande W of San Ildefonso, 5.X.1974. Guadalupe Co.: Pecos River at Puerto de Luna, 28-29.IX.1974. Quay Co.: Canadian River E of Logan at mouth of Revetto Creek, 1.X.1974. Curry Co.: Frio Draw 16 mi. N of Clovis, VIII,IX.1967. Socorro Co.: Rio Grande at San Marcial, 11.VII.1976. Hidalgo Co.: Gila River at Arizona state line, 21.IX.1974. Doña Ana Co.: Rio Grande near El Paso, Texas, XI,XII.1974, 14.II. and 8.VII.1976. Eddy Co.: Pecos River E of Artesia, X-XII.1974; Pecos River nr. Texas state line, X,XI.1974 and 7.III.1976. – **D.** Texas (all JES): Lubbock Co.: Lubbock, 6.VIII.1956. Victoria Co.: Victoria, nr. Guadalupe River, 14.VI.1960. Liberty Co.: 7 mi. W of Liberty, 16.VI.1960. Orange Co.: Beaumont, nr. Neches River, 12-13.VI.1960. – **E.** Louisiana (all JES): Sabine Co., Many, bank of polluted stream, 6.IV.1960. Natchitoches Co.: Red River N of Grand Encore, 5.X.1959.

Distribution and ecology. *T. pelsuei*, spec. nov. is widely spread in the southwestern to mid-southern United States, and likely in northern Mexico as well. So far, the species has not been documented farther north than central California, but this range may be well extended in the Midwest region (JES, pers. comm.). Sources include shallow standing waters as well as slow- to moderate-flow zones of rivers, creeks and flood control channels.

In the Los Angeles area, larvae were found on sandy and silty substrates with detritus and frequently also clusters of filamentous algae. Water temperatures measured during sampling ranged

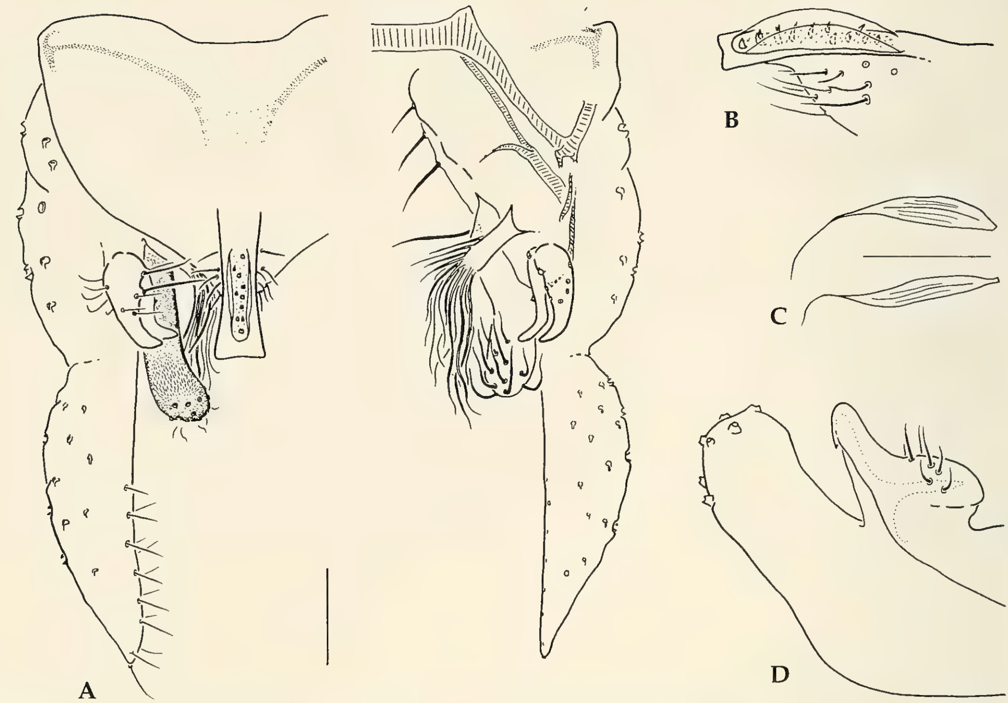

Fig. 3. *Tanytarsus angulatus* Kawai. Adult male. **A.** Hypopygium, dorsal (scale 50 µm). **B.** Anal point, lateral. **C.** Subulate setae of median volsella (scale 50 µm). **D.** Superior and inferior volsellae, lateral aspect.

up to 29 °C, and specific conductances from 385 to 1410 µS/cm, with salinities never above 0.7 ‰. Darby (1962) collected adults around rice fields in central California. The few specimens taken in emergence traps all came from moving water and aquatic plant stands including *Spirogyra* growths. Aerial catches were made from mixed swarms in which *T. pelsuei*, spec. nov. was taken along with two or three of the species *Parachironomus tenuicaudatus*, *Cricotopus bicinctus*, *C. sylvestris*, and *Apedilum* spec.

In warmer regions of its distribution area, *T. pelsuei*, spec. nov. adult emergence apparently can occur throughout the year, and unsynchronized multivoltine patterns may be inferred.

T. pelsuei, spec. nov. was present at roughly half of the sites visited, and in almost 50 % of the samples collected during the author's southern California study. Due to its propensity to develop abundantly in a variety of habitats, the species is considered one of the primary local nuisance chironomids.

Tanytarsus angulatus Kawai, 1991

"Calopsectra n.sp. 1" Frommer & Sublette, 1971; record.
Tanytarsus angulatus Kawai, 1991: 168; adult male. Sasa & Kikuchi (1995); adult male.

Description

Larva (see tab. 1).

Coloration. Head light brown, postmentum with extensive postero-median dark area. Thorax green or yellowish green, abdomen pale red to orange. In prepupae: red tinges fading, green and yellowish areas increasing.

Head. Labrum with SI combed, SII simple and bladelike, SIII, SIV simple, fine; all long chaetae simple. Premandible with 4 not significantly darkened teeth (the most proximal small), and with the usual lateral spine. Mandible with 1 dorsal (pale), 1 apical and 3 inner teeth (dark). Antenna (Fig. 4D)

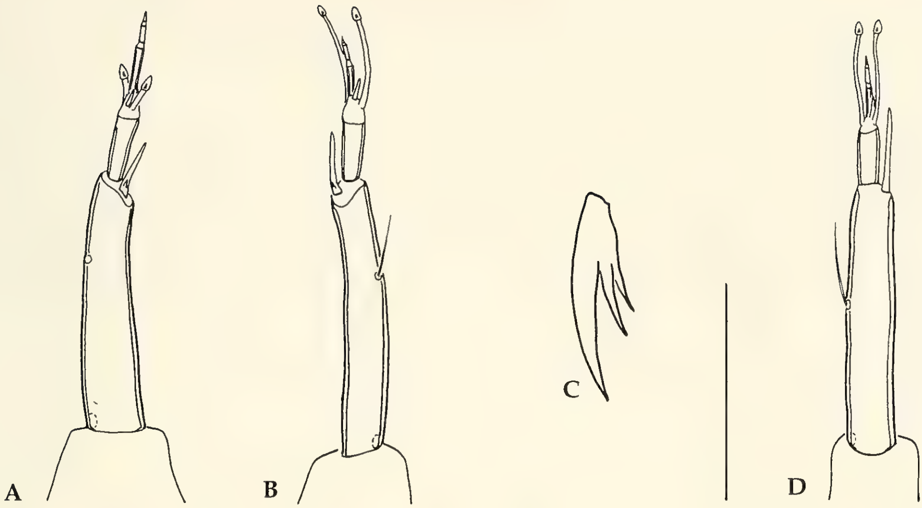

Fig. 4. Larval structures of three species of *Tanytarsus* – **A, B, D**: antennae (scale 100 µm); **C**: labral seta SI (not to scale). **A.** *T. challeti*, spec. nov. **B, C.** *T. pelsuei*, spec. nov. **D.** *T. angulatus* Kawai.

with seta just beyond middle of segment I; blade longer than segment II. Mentum with lateral parts of trifid median as dark as 5 pairs of lateral teeth, the middle part lighter.

Abdomen. Procercus low, distally sclerotized, with 7-8 anal setae and 2 short lateral setae. Anal tubules normally developed, longer than supraanal setae.

Pupa (see tab. 2).

Coloration. Cephalothorax mottled brown, abdomen light green. Exuviae with cephalothorax mostly brown incl. antennal sheaths and wing sheath vein traces; abdominal tergite II with pair of posterior, triangular pigment patches, TVIII laterally, almost all of TIX brown.

Head. Cephalic tubercle (CT) prominent, its narrowed apex elongate, about ⅙ to ⅓ length of frontal seta. Antennal pedicel sheath with tubercle at most ½ as long as apex of CT.

Thorax. Median suture area nearly smooth, at most with short, narrow strips of granules. Precorneal setae in a row slanting from anterodorsal to posteroventral. Prealar mound an elongate, posteriorly swollen ridge.

Abdomen. Tergite armament (Fig. 5E): TII with extensive shagreen in "Π" pattern, the longitudinal strips narrowly separated, posteriorly often meeting, postero-laterally flaring to ends of hook row, the latter spanning about ½ of segment width (⅔ of T); TIII with pair of single, staggered rows of long needle spines laterally accompanied by scattered shorter spines and points and a narrow band of brown pigment, rows moderately diverging to posterior and reaching from anterior of seta D_1 to posterior of D_5, scattered shagreen or patches sometimes present antero-lateral of needle rows; TIV with pair of nearly parallel needle patches (Fig. 5F) laterally accompanied by 2-3 rows of points anteriorly and by brown pigment band throughout, anterior needles often distinctly shorter, rows reaching from about level of O-setae to near D_5; TV with pair of longitudinal point patches roughly between levels of setae O and D_1, integument in patches mostly brown, patches about 5 rows wide, the antero-median points often slightly elongate; TVI with patches similar to V but only half as long; TVIII with small anterolateral shagreen patches; TIX with pair of anterior transverse shagreen patches including short row groups. Sternite armament: SII with anterior transverse fine shagreen, SVIII with antero-lateral shagreen. Dorsal setae I-II: 3; III-VII: 5; VIII: 1 (long, postero-lateral); O-setae: 1 pair each on II-VII; sensillae campaniformes: 1 central and 1 posterior pair on II-VI. Lateral setae I: 0; II-IV: 3; V-VI: 2 regular setae + 1 posterior taenia (occasionally semi-taeniate or regular); VII: 2(3) regular + (1)2 taeniae; VIII: 5 taeniae, $L_{(2-)3}$ usually displaced toward median, L_5 rarely reduced to regular. Ventral setae I: 0; II: 3; III-VII: 4; VIII: 1 central pair of taeniae. PsA absent. PsB weak, rarely prominent. Anal

comb with 7-13 marginal teeth, ventral surface ("disc") usually mostly covered with teeth, including some not much smaller than those on margin.

Adult male (see tab. 3, and Kawai 1991).

Coloration. Thorax base color yellowish to green, abdomen bright green; antennal pedicel, flagellum and plume, thoracic vittae, median anepisternum II, preepisternum (except dorsal margins), and postnotum (except anterior margin) brown; foreleg brownish from about mid femur, darker than mid and hind legs; wing brachiolum (proximally) and squama (distally) each with a brown spot.

Head. Eye extension reaching little more to median than ventral eye parts, with median marginal contour indistinct, grading into microtrichiose frons. Frontal tubercles digitiform to weakly conical.

Thorax. Scutellum usually with three discrete groups of setae, the median group set slightly more posterior.

Wing (see Kawai 1991: fig. 6a). Note the presence of membrane setae well proximal of RM in cell m_{1+2}, and the setae in cell an (marginally). Anal lobe not prominent.

Legs. Segment lengths as percentage proportions of the respective tibia

A: California (smallest/largest complete specimen):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	183/169	100	229/204	105/91	90/76	67/60	29/28
P_2	122/121	100	62/59	36/33	25/24	16/13	11/11
P_3	107/106	100	65/62	40/39	36/34	22/21	10/11

B: Japan (holotype/paratype no. 24):

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5
P_1	198/195	100	262/255	124/116	102/95	81/70	31/32
P_2	126/-	100	63/-	34/-	25/-	14/-	11/-
P_3	109/-	100	72/-	44/-	36/-	22/-	11/-

Tibial spur length increasing from P_1 to P_3, on P_2 and P_3 one spur each with outcurved apex, on P_2 the straight spur considerably shorter; mid and hind tibial combs separate, fully developed.

Hypopygium (Fig. 3, and Kawai 1991: fig. 6b). Anal tergite bands separate, usually ending far proximal of anal point origins. T IX with 10-20 distal setae, dorsomedian setae and lateral teeth absent. Anal point fairly wide, narrowest in middle, apex subrectangular, occasionally with shallow posteromedian emargination; sensillar pit extensive, flanked by anal point crests; pit floor with 5-12 (13) uni- to multi-peaked sensillae basiconicae in single to irregularly double row, and with sparse microtrichia, except distally. Superior volsella (Figs 3A, D) in dorsal view slender, with long, bare distal hook to median; setiger with 11-13 setae from medio-proximal to about mid volsella, across dorsal surface there, and laterally to proximal; the most anterior median seta occasionally in very basal position proximal of digitus origin, 2-3 further distal median setae stronger and longer than others; digitus long, distally curving to median, paralleling and almost as wide as distal hook of volsella; origin of digitus connected to superior and inferior volsella (Fig. 3D). Inferior volsella with little distal expansion to dorsal (Fig. 3D), densely microtrichiose and with distal median to caudal and dorsal setae. Median volsella with stem shorter than superior volsella, carrying many setae some of which reach beyond tip of inferior volsella; with about 10 lamellate setae of subulate type (Sæther 1980: fig. 20), their distal thirds to halves abruptly attenuated to single filaments (Fig. 3C). Gonostylus distally strongly narrowing to more or less pointed apex.

Adult female.

Similar to male except as listed in tab. 4. Genitalia: indistinguishable from other *Tanytarsus* females studied.

Identification. The only notable difference detected between Japanese and Californian males of *T. angulatus* lies in proportionately slightly shorter fore tibiae on the type specimens, yielding a higher LR_1 at comparable body sizes (see leg segment tabulations above, and tab. 3). This discrepancy is

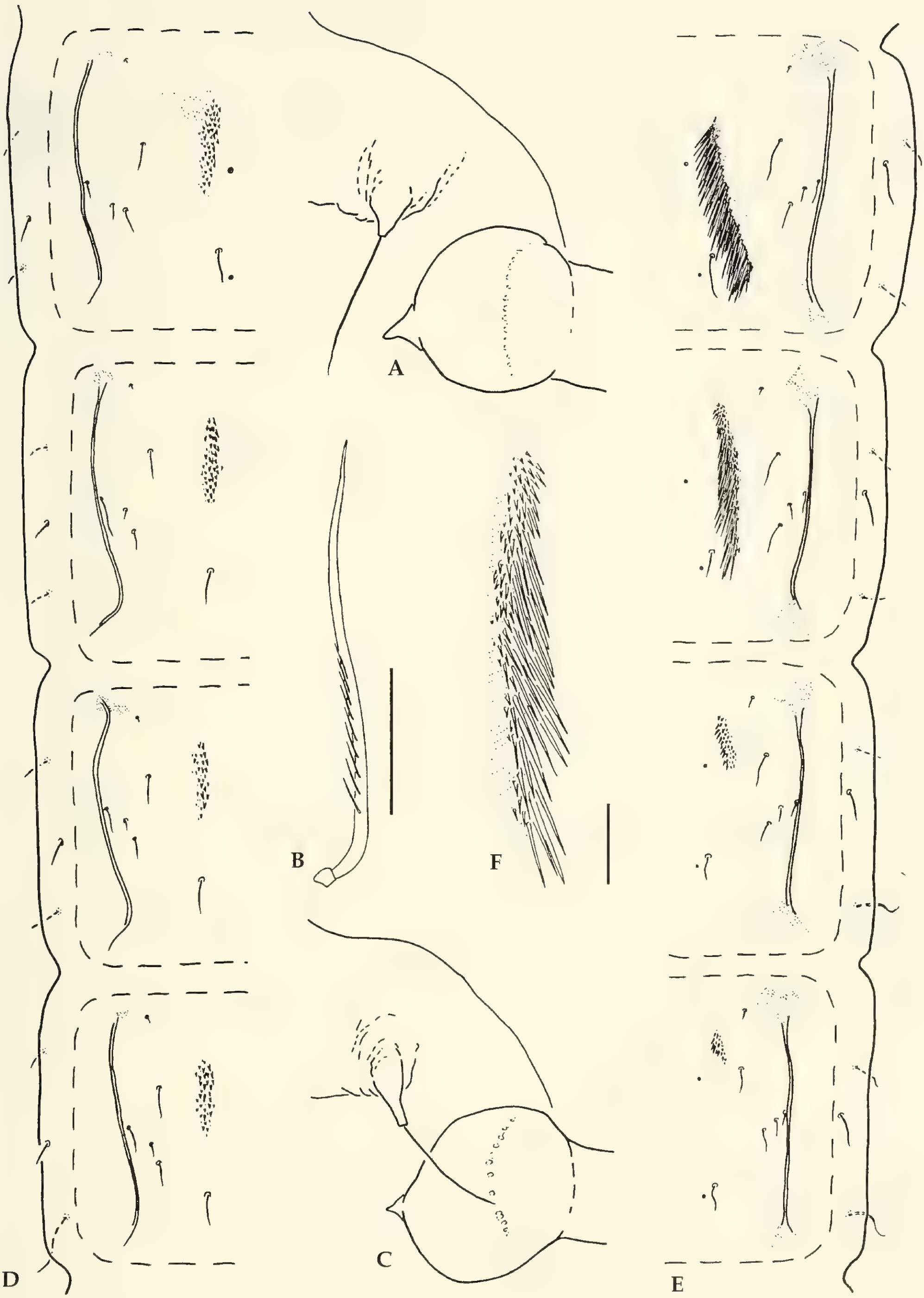

Fig. 5. Pupal structures of three species of *Tanytarsus* – **A, C**: frontal region; **B**: thoracic horn (scale 200 µm); **D, E**: abdominal terga III-VI; **F**: spine patch of TIV (scale 50 µm). **A, B.** *T. challeti*, spec. nov. **C, D.** *T. pelsuei*, spec. nov. **E, F.** *T. angulatus* Kawai.

interpreted as inter-populational variation, and cautions against overstressing such isometrics in diagnoses if data are based on material from single or few populations.

Differential diagnoses

The adult male of *Tanytarsus angulatus* Kawai differs from all described congeners by its unique combination of hypopygial characters. An anal point distally widened as in *angulatus* is known only from *T. occultus* Brundin, but that species has significantly larger sensillae basiconicae, fully developed dorsomedian T IX setae, and short median volsella setae without distal filaments (Reiss & Fittkau 1971). The pupae of the two species are also very different, the abdominal armament, for example, lacking long needle spine patches in *occultus* (Langton 1991).

The median volsella of *angulatus* resembles those of *T. lugens* Kieffer and *bathophilus* Kieffer (compare fig. 3C to Reiss & Fittkau 1971: fig. 40). Like *angulatus*, *T. lugens* and *bathophilus* also lack dorsomedian T IX setae, and show the tendency of the most anterior median seta on the superior volsella to move into a very proximal and ventral position. On the other hand, the digitus is very reduced in *bathophilus*, and even lacking in *lugens*.

A most closely related species, however, appears to be *T. takahashii* Kawai & Sasa, 1985, possessing a very similar median volsella, digitus and setation pattern on the setiger of the superior volsella. The latter is also slender, but the distal section is not as long and strongly hooked as in *angulatus*. The inferior volsella and gonostylus are again similar. The anal point of *takahashii* differs by ending in a gently narrowing, rounded rather than rectangular tip. The ninth tergite bears a few dorsomedian setae (absent in *angulatus*), but these appear relatively strongly reduced.

Among known Holarctic *Tanytarsus* pupae, *T. angulatus* Kawai is very similar to *bathophilus* Kieffer in many features (e.g., details of the abdominal armament pattern), but *bathophilus* specimens of comparable size always have much longer thoracic horns (Langton 1991: range 465-740 µm), the precorneal setae arranged in a triangle, and the hook row covering only about ⅓ of the width of abdominal segment II (Langton 1991, and author's observations on ZSM material). The pupa of *T. takahashii* Kawai & Sasa is unknown.

Although an overview allowing comparisons with all described *Tanytarsus* larvae is unavailable, those of *T. angulatus* Kawai should be identifiable by the characters given in Table 1, especially by the head capsule pigment pattern combined with only lightly sclerotized premandibles. The larvae of *T. takahashii* Kawai & Sasa and *bathophilus* Kieffer are undescribed.

Unassociated female adults of *T. angulatus* could not be identified against other species in the California samples with any of the characters examined. While the number of sensillae chaeticae on mid tarsus 1 of *angulatus* is always low compared to specimens of *challeti* and *pelsuei*, nov. specs. (see tab. 4), it is similarly low in *T. dendyi* Sublette, another species occurring in the study area.

Material analyzed. Japan, Toyama Prefecture (from priv. coll. K. Kawai): holotype ♂, Dokawa River near Matsuo Jinja, 24.V.1983; 1♂ (paratype No. 24), same as holotype; 1♂ (paratype No. 22), Oyabe River at Hijiri-bashi, 29.V.1984; 1♂, (paratype No. 27), agricultural canal near Toyama prison, IV-V.1983. – **USA**, California, leg. M. Spies unless otherwise specified (at GLACVCD, OCVCD, ZSM): **A.** Los Angeles County: 1♂, Long Beach, Los Angeles River at Pacific Coast Hwy., 24.III.1993; 1 L, 1 Pex, Pico Rivera, Rio Hondo Coastal Spreading Basin #1, 13.IV.1993; 1♂, 1 Pex+♀, Pico Rivera, San Gabriel River at Washington Blv., 13.IV.1993; 1 Lex+Pex+♀, as previous, but San Gabriel River Spreading Basin #3; 1 Lex+Pex+ph♀, La Mirada, Coyote Creek at Hillsborough Dr., 3.V.1993; 1♂, as previous, but at Dundee Court. – **B.** Orange County: 3 Lex+P+ph♂, 1 P+ph♂, 1 Lex+Pex+ph♀, 4 Lex+Pex, 2 Pex, 1 L, Anaheim, Atwood Channel betw. Rose Dr. & Miller St., 19.III.1993; 1 Lex+Pex+♂, Anaheim, Anaheim Lake, 19.III.1993; 1 Pex+♂, Anaheim, Santa Ana River channel E of Lakeview Av., 17.V.1993; 2 Pex, as previous, but retarding basin N of Ball Rd., 9.XI.1992; 1♂, Fullerton, from trap at Fullerton College, 19.V.1993, leg. OCVCD; 2♂♂, Placentia, Chapman & Orangethorpe Aves., 16.III.1993, leg. D. D. Loughner; 1♂, as previous, but at Pasteur Pl., 10.III.1993; 1♂, Anaheim, from trap near Santa Ana River, 23.XI.1993, leg. OCVCD.

Further records (all USA, California). **A.** Leg. M. Spies: Los Angeles and Orange Cos., numerous specimens of all stages from the above and adjacent sites, X,XI.1992 and III,IV.1993. – **B.** Humboldt Co.: Fortuna, 24.V.1960, leg. L. W. Mackay (JES, pers. comm.). Shasta Co.: Redding, Kutras Lake, 1.VI.1965, leg. G. Grodhaus (JES). Tehama Co.: Red Bluff, 1.VI.1965, leg. G. Grodhaus (JES); Black Butte Reservoir, 13.V.1966, leg. Oldham et al. (JES). Butte Co.: Thermalito Afterbay W of Oroville, V,VI.1968, leg. G. Grodhaus (JES). Yolo Co.: Davis, 1.VI.1975, leg. S. L. Clement (JES). Contra Costa Co.: Antioch, 5-6.IV.1956, leg. M. Wasbauer (JES). Los Angeles Co.: San Gabriel, 8-16.I.1962, leg. S. I. Frommer (JES); Whittier, Rio Hondo, 20.XI.1959 and 17.II.1960, leg. L. D. Anderson (JES); as previous, but 3-7.V.1962 (JES). Riverside Co.: Corona, 29.IV.1967, leg. R. D. Sjogren (JES); Arlington,

V,VI.1967, leg. R. D. Sjogren (JES); Hidden Lake 3 mi. N of Arlington, V,VI.1967, leg. R. D. Sjogren (JES); Norco, V,VI.1967, leg. R. D. Sjogren (JES); 2 mi. W of Pedley, 28.IV. and 9.XI.1967, leg. R. D. Sjogren (JES); Deep Canyon near Palm Desert, 18.V.1964, leg. M. E. Irwin (Frommer & Sublette 1971, JES).

Ecology and phenology. The larvae from which the type series of *T. angulatus* was reared all came from sand or mud substrates in stagnant parts of Japanese rivers classified as β- to α-mesosaprobic (Kawai et al. 1989, Kawai 1991). In urban California, the species has been found in flowing waters ranging from rivers to concrete-lined open conduits, but also in the littoral of flood control basins, with substrates of mostly silt and sand enriched with detritus and algal growth. Instantaneous daytime water temperatures recorded by the author ranged from 17 to 29 °C, and conductivity from 380 to 1410 μS/cm, while salinity never exceeded 1 ‰.

The Japanese collections were made in April-June, October and November (Kawai 1991), but no samples were taken at *angulatus* sites in the months inbetween (Kawai et al. 1989). In the southern California study, pre- or post-emergence stages were also encountered at practically all sampling times (September-November, March-June). Non-synchronous, multivoltine life cycles can thus be inferred for populations in both cases.

T. angulatus was present at two out of three sites visited during the author's nuisance midge study, and in over 50 % of the samples. Adults of the species have also been encountered at sites visited in response to midge control requests. Consequently, *angulatus* is ranked among those Chironomidae with the highest nuisance potential in southern California.

Faunal relations. Prior to the present study, *Tanytarsus angulatus* Kawai was known only from a limited area in Japan: several connected and neighboring rivers draining into Toyama Bay, west-central Honshu (Kawai 1991, Sasa & Kikuchi 1995). In light of the California records, the distribution now appears as two widely disjunct patches of very restricted extent within their respective Far East Palaearctic and Western Nearctic regions. To this author's knowledge, such a pattern has not been reported in the Chironomidae, and seems at least exceptional in aquatic zoogeography in general (Banarescu 1992). However, most areas along a potential linking path across the Bering Strait have not received sufficient coverage in chironomid research to reasonably exclude the possibility of such dispersal.

As discussed above, *T. angulatus* stands isolated among its American congeners on present morphological evidence. Its apparent closest relative, *T. takahashii* Kawai & Sasa, is widespread in Japan (Sasa & Kikuchi 1995) and probably the eastern Palaearctic in general (new records from ZSM material: China, Beijing, 8.VI.1980, leg. E. J. Fittkau; North Korea, 3 records in Reiss (1980) sub "*Tanytarsus* sp. K1"). *T. bathophilus* Kieffer, with a highly similar pupa and partially similar male hypopygium, so far is known only from the western Palaearctic. The conclusion from these putative relations of *angulatus* would make it an immigrant to the Nearctic with (eastern) Palaearctic roots.

As for the above-discussed link between *Tanytarsus challeti*, spec. nov., *T. pelsuei*, spec. nov. and their Australian counterparts, the routes, directions and time frames of the inferred trans-Pacific dispersal can not be firmly established on the present evidence. However, while extensive distributions of three of the four members in the hypothesized Australian/Californian clade point to an earlier date for the underlying biogeographic event, circumstances in the case of *T. angulatus* Kawai leave recent human transport by ship or airplane as a plausible explanation.

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Goeldichironomus neopictus, a new species from the southeast of Brazil: description and bionomic information

(Insecta, Diptera, Chironomidae)

Susana Trivinho-Strixino and **Giovanni Strixino**

Trivinho-Strixino, S. & G. Strixino (1998): *Goeldichironomus neopictus*, a new species from the southeast of Brazil: description and bionomic information (Insecta, Diptera, Chironomidae). – Spixiana **21/3:** 271-278

This study describes the immature stages and adults of *Goeldichironomus neopictus*, a new species from the southeast of Brazil which lives in marginal aquatic vegetation in lentic environments. The imago presents morphological characteristics of the *pictus* group, but with a different pattern of thoracic and abdominal coloration. Egg masses obtained from field-collected females were maintained until eclosion (nearly 44 hours). Under laboratory conditions (20-26 °C) the cohort completes its life cycle in an average of 27 days (23-33 days). Through the morphometric dimensions and duration of each instar, length and weight curves for the species were constructed and some bionomic and biometric characteristics were established.

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Introduction

During an intensive survey program of the reservoirs in the São Carlos region (São Paulo State, Brazil) we found a new morphospecies of *Goeldichironomus* Fittkau, 1965, a genus with nine previously recognized species (Spies & Reiss 1996), distributed in subtropical and tropical areas from South America to southern North America and Hawaii, and occurring in littoral biotopes of standing waters (Reiss 1974).

In this article we describe the tenth species for the genus, from mature larvae, pupae and adults, and summarize bionomic and morphometric information obtained for this species from laboratory rearings. All the material examined was mounted on slides, and the morphological terminology used follows Saether (1980). The measurements are given by a mean value followed by the ranges in parentheses.

Goeldichironomus neopictus, spec. nov.

Types. Holotype: ♂ imago, São Carlos, SP, Brazil, Represa do Monjolinho, University Campus (UFSCar), May 1982. – Paratypes: 3♂ imagoes, 1♂ imago and its pupal exuviae, 5♀ imagines, 4 pupae and 5 larvae, from the same locality, May 1982. The holotype and most paratypes are deposited in the Laboratory of Aquatic Entomology collection of the Federal University of São Carlos, São Paulo, Brazil (UFSCar). One male paratype is deposited in the Zoologische Staatssammlung, Munich, Germany.

Description

Male imago (n=5).

Total length. 5.5 mm (5.4-6.2). Color greenish yellow with dark brown thoracic markings and brown bands on abdomen.

Head. Pale yellow. Antenna and plume yellowish; AR = 3.37 (3.13-4.23). Maxillary palps yellowish; palpomeres 1-5 = 48, 60, 240, 222, 360 mm.

Thorax (Figs 1a, b). Greenish yellow, with three pairs of dark brown mesonotal spots; the anterior 2 pairs are connected by a narrow band. Sternum yellowish brown. Scutellum greenish. Postnotum yellowish brown, slightly darker in distal portion. Thoracic setal count: Acrostichals 22 (20-23), dorsocentrals 30 (29-33), prealars 8, supraalar 1, scutellars 18 (17-20).

Wing. Length 2.7 mm (2.5-2.9), transparent with lightly pigmented veins; C ending close to R_{4+5}, before wing apex; R_{2+3} closer to R_1; FCu slightly more distal than RM; VR = 1.06; WW = 0.28.

Legs. PI: Femur, Tibia and Ta1 + Ta2 greenish yellow, each with an apical brown ring, other segments pale brown. PII and PIII: Femur and Tibia greenish yellow, other segments pale brown. Lengths in mm as in Table 1A.

Abdomen (Fig. 2). Greenish yellow. Tergites II-IV with brown bands along posterior margins. Hypopygium (Fig. 3). Anal point narrow with apex hooked to ventral (Fig. 4). Superior volsella sickle-like (Fig. 5). Inferior volsella microtrichiose, bearing coarse setae, some of them apically branched (Fig. 6). Gonostylus stout, with 8-9 setae on distal inner margin.

Female imago (n = 5).

Total length. 6.7 mm (5.9-7.2). Coloration as male, but generally darker.

Head. Antenna light brown; antennal flagellomeres 2-6 = 204, 156, 156, 162, 186 mm. Maxillary palpomeres 1-5 = 60, 60, 240, 276, 426 mm.

Thorax. Color pattern as male. Thoracic setal count: Acrostichals 28 (27-30), dorsocentrals 41 (40-43), prealars 8, supraalar 1, scutellars 20 (19-23).

Wing. Length 3.5 mm (3.4-3.7); VR = 1.10; WW = 0.36.

Legs. Lengths in mm according to Table 1B.

Abdomen. Brownish yellow; posterior bands of tergites II-IV less distinct.

Pupa (n=5).

Exuviae length 8.1 mm (7.5-8.6). Abdomen in dorsal aspect as in Fig. 7a. Tergite I without shagreen. Tergites II-VI with shagreen points enlarged near anterior and posterior margins. Sternites I-V with shagreen as in Fig. 7b. Segment VIII with brown anal comb bearing 5-8 marginal teeth (Fig. 8). Segments I-IV = 1, 3, 3, 3 L setae; V-VIII = 4, 4, 4, 5 LS setae. Anal lobe on each side with 1 stout dorsal seta and 75-80 taeniate fringe setae.

4^{th} instar larva (n=5).

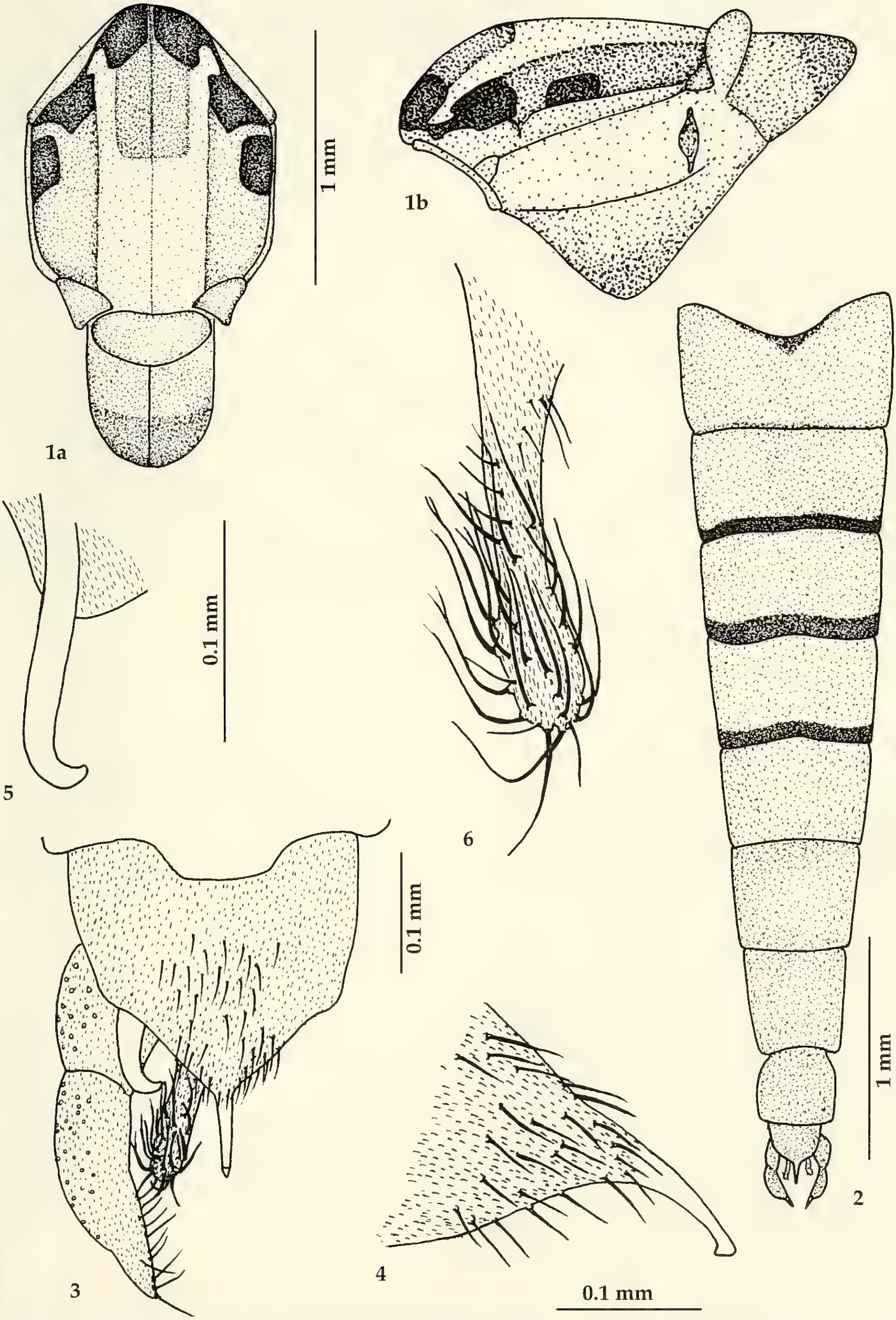
Total length 7.5 mm (6.8-8.5). Color red, head light brown with dark ventral occipital margin.

Head. IC = 0.71 (0.70-0.81). Width 0.54 mm (0.50-0.58), length 0.70 mm (0.68-0.78). Frontoclypeal apotome and labral sclerites 1 and 2 as in Fig. 9. Premandible with 3 teeth (Fig. 10). SI plumose on both sides (Fig. 11). Pecten epipharyngis with 10 longer and 5-6 smaller teeth (Fig. 12). Antenna (Fig. 13)

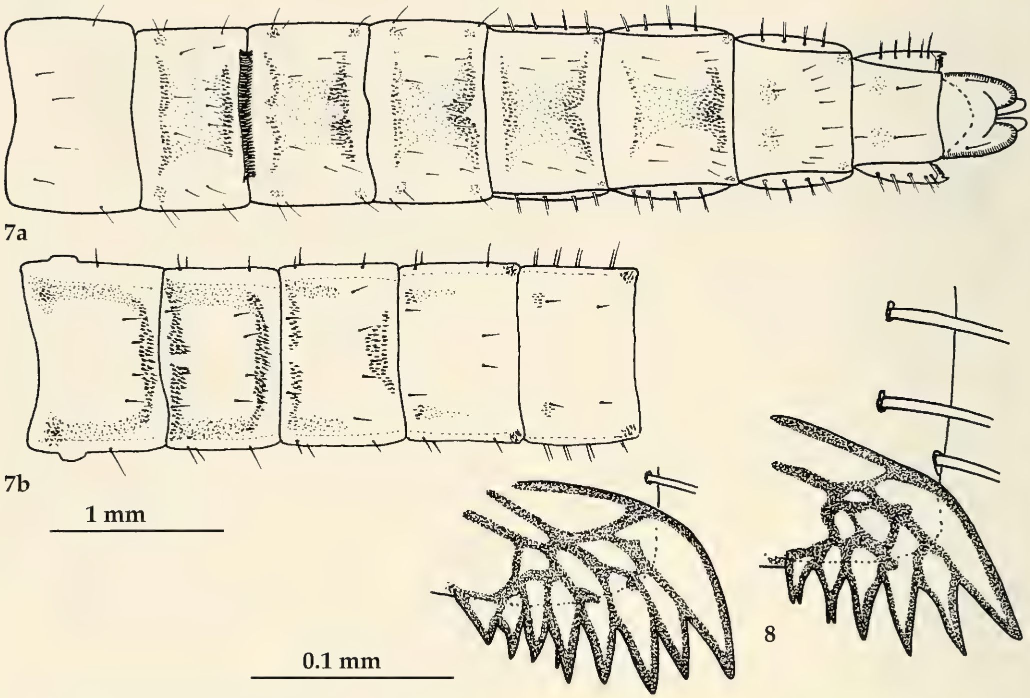
Tab. 1. Leg segments of *Goeldichironomus neopictus*, spec. nov. **A.** ♂ imago. **B.** ♀ imago.

A	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR
PI	1200	1160	1520	760	680	680	280	1.31
PII	1200	1200	640	360	280	160	120	0.53
PIII	1280	1440	960	480	440	240	120	0.67

B	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR
PI	1600	1600	2080	1040	960	1040	360	1.30
PII	1600	1640	800	440	320	160	120	0.49
PIII	1640	1960	1200	400	560	240	120	0.61



Figs 1-6. *Goeldichironomus neopictus*, spec. nov. ♂ imago. **1.** Thorax. **a.** Dorsal view; **b.** Lateral view. **2.** Abdomen. **3.** Hypopygium. **4.** Anal point, lateral view. **5.** Superior volsella. **6.** Inferior volsella.



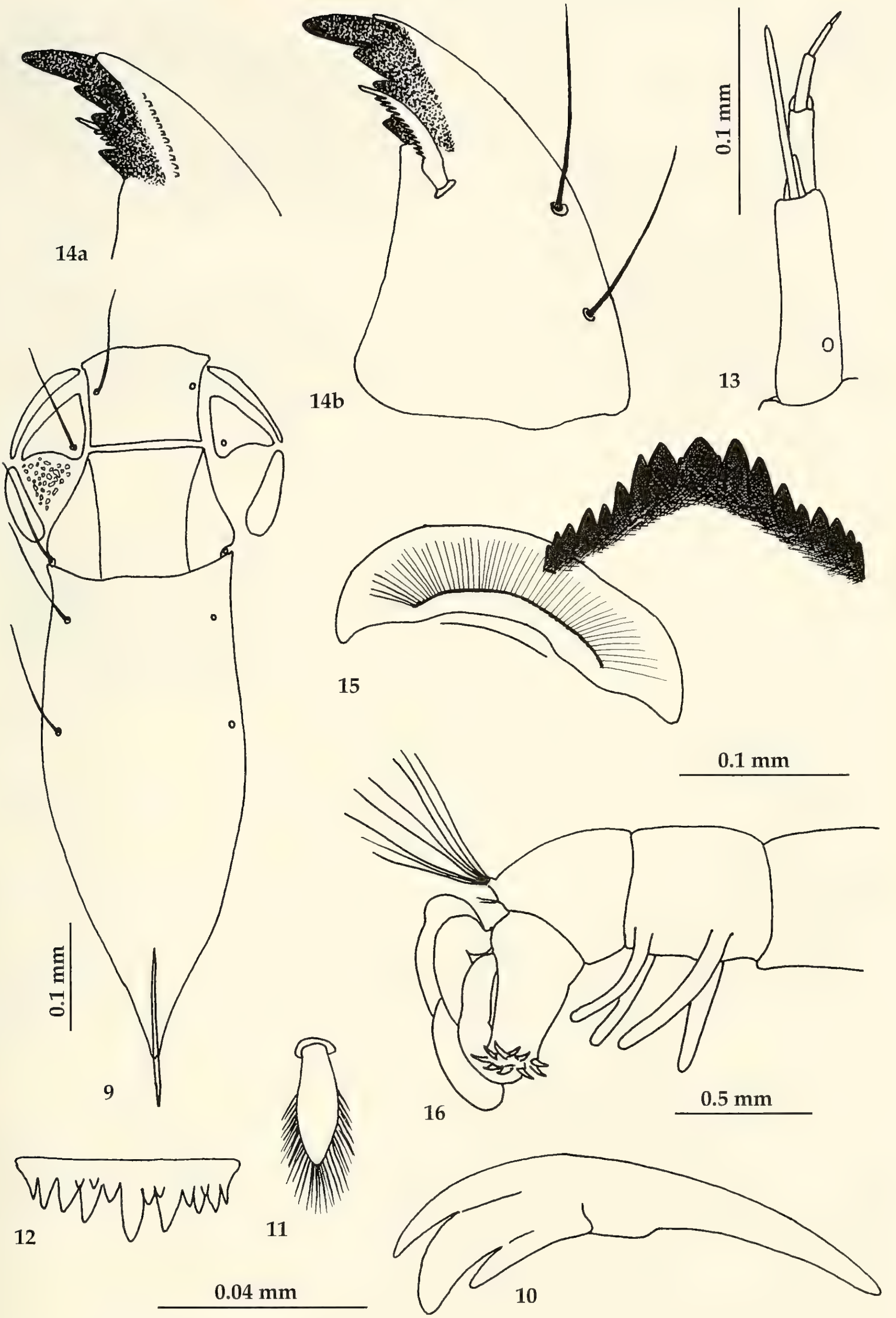
Figs 7-8. *Goeldichironomus neopictus,* spec. nov. Pupa. **7a.** Abdominal tergites. **7b.** Abdominal sternites I-V. **8.** Anal comb variation.

length 0.19 mm (0.18-0.20); AR = 1.17; Ring organ near antennal base; blade not surpassing segment 4. Mandible (Figs 14 a, b) length 0.27 mm (0.24 0.30), with dark apical and three inner teeth and two small ventral teeth at the bases of the distal two inner teeth; dorsal tooth pale; seta subdentalis long and serrated. Mentum (Fig. 15) with slightly crenate median and 8-10 dark lateral teeth; fourth lateral tooth smaller than adjacent ones.

Abdomen (Fig. 16) with two pairs of slightly curved ventral tubules on segment VIII, measuring 0.62 mm (0.57-0.66) in length. Anal tubules large with a median constriction. Procercus with 8 coarse anal setae.

Remarks

Goeldichironomus neopictus, spec. nov. shares the characteristics of the *pictus* group, established by Reiss (1974), which includes *G. pictus, G. serratus*, and the more recent *G. carus* Contreras-Lichtenberg, 1982 and *G. maculatus* Trivinho-Strixino & Strixino, 1991, all with dark brown thoracic spots and/or dark brown abdominal bands. The new species displays the same thoracic pattern as *G. pictus*, differing in the absence of supraalar callus spots and in the presence of brown bands on posterior margins of abdominal tergites II-IV. In the latter aspect it approaches *G. maculatus* and *G. serratus*. In spite of the similarity of the immature forms, the shagreen presence on sternites IV and V of the pupa and the length of the ventral and anal tubules of the larva seem to be characteristics which differentiate *G. neopictus* from the other species of the group.



Figs 9-16. *Goeldichironomus neopictus,* spec. nov. Larva. **9.** Frontoclypeal apotome and labral sclerites 1 and 2. **10.** Premandible. **11.** Labral seta SI. **12.** Pecten epipharyngis. **13.** Antenna. **14.** Mandible. **a.** Ventral view; **b.** Dorsal view. **15.** Mentum and ventromental plate. **16.** Posterior abdominal segments.

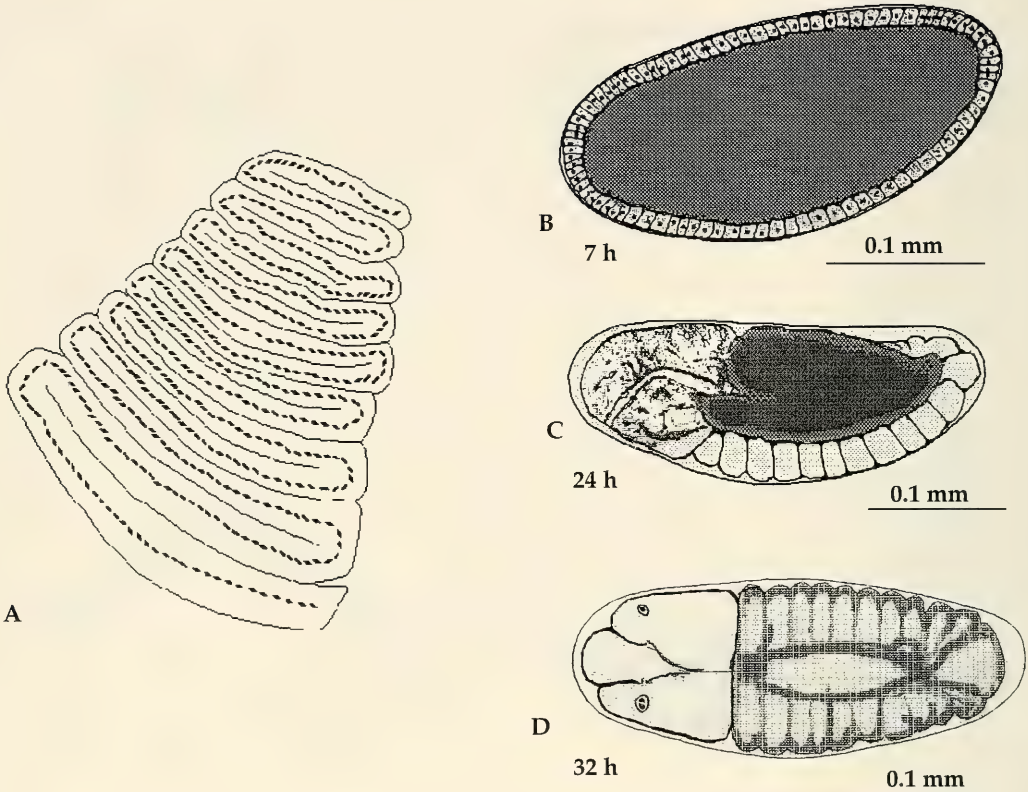


Fig. 17. A. *Goeldichironomus neopictus*, spec. nov. Egg mass. **B, C, D.** Embryo after 7, 24, and 32 hours.

Bionomics

The larvae of *G. neopictus* are associated with aquatic macrophytes, and were collected in stands of *Pontederia* and *Eichhornia* in a small reservoir (Represa do Monjolinho) situated on the university campus (UFSCar).

Since both adults and larvae were easily captured, and with the aim of obtaining additional information about the bionomics as a subsidy for bioassays, laboratory rearing was carried out which permitted the observation of oviposition and embryonic and larval development until the emergence of adults.

A. Oviposition and embryonic development

Female imagines captured in the field were maintained in flasks with water which were covered with nylon netting. During oviposition the female rests on the wall of the flask and, with its abdomen curved downwards, executes lateral movements until the eggs are completely expelled. The small egg mass remains attached to the female which, after undertaking circular flights, deposits it on the water surface. After water contact, the gelatinous mass takes on the appearance of a truncated triangle, containing 500-600 eggs (Fig. 17A).

The egg masses, maintained in glass petri dishes with distilled water, were periodically examined for embryonic developmental stages (Figs 17B, 17C, 17D) until hatching, which took place about 44 hours after oviposition.

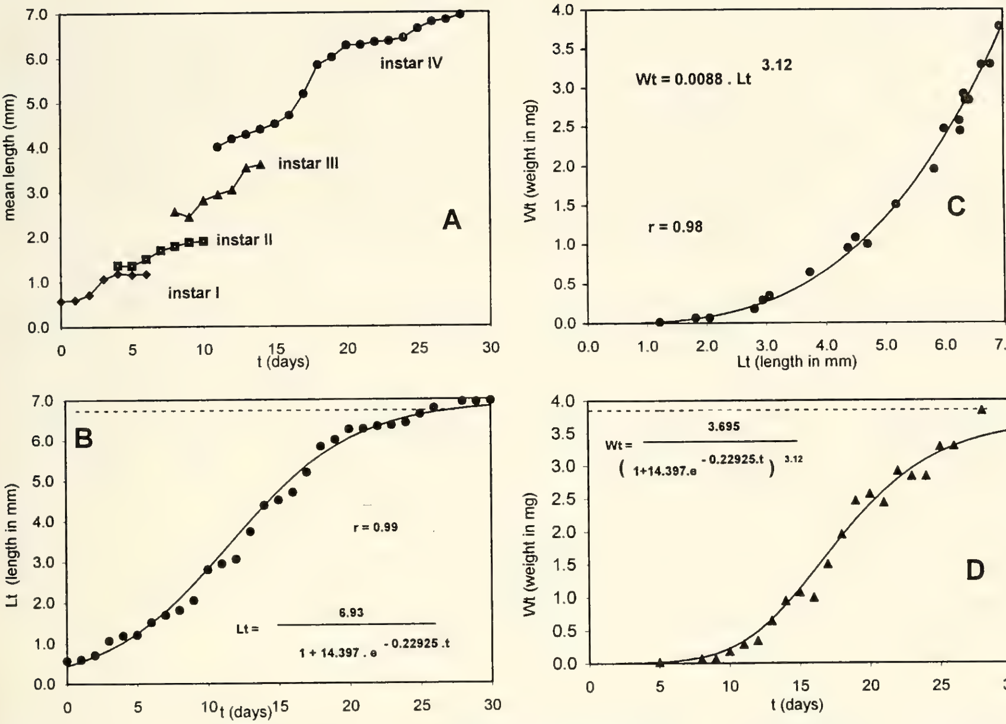


Fig. 18. *Goeldichironomus neopictus*, spec. nov. Biometric growth parameters. **A.** Growth length of each instar. **B.** Cohort growth length curve. **C.** Weight/length relation. **D.** Cohort growth weight curve.

B. Larval development

Newly hatched larvae were reared in plastic trays (4 l of distilled water + 1 g of chicken ration/week) and maintained at room temperature (20-26 °C) at a numerical density of approximately 100 larvae/ 0.1 m^2 (Strixino & Strixino 1982).

The cohort completed its life cycle in 27 days (23-33). Daily measurements of total larva length, head length, and larva weight permitted the identification of instars and an outline of some bionomic parameters for the species (Tab. II).

In spite of the slight size overlaps of the different instars (Fig. 18A), the mean growth-length curve (Fig. 18B) showed, in its linearly transformed form, a high correlation coefficient (r = 0.99), and was expressed by Krüger's growth model (Krüger 1973).

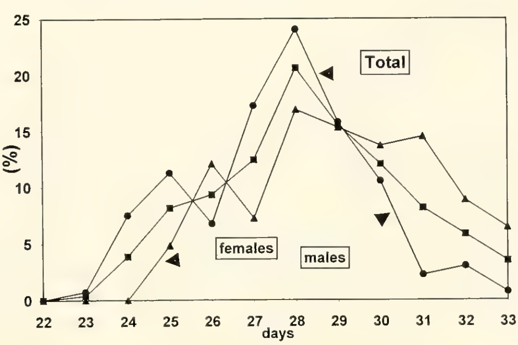


Fig. 19. *Goeldichironomus neopictus*, spec. nov. Emergence in laboratory culture.

Tab. II. Biometric parameters of each larval instar of *Goeldichironomus neopictus.*

Instar	Length (mm) Min.-Max.	Ventral head length (µm) Min.-Max.	Weight (mg) Min.-Max.	Mean duration (days)
1	0.578-1.170	42- 48	0.0016-0.0143	4
ri	1.380-1.890	81- 90	0.0240-0.0641	4
iii	2.558-3.600	129-141	0.1640-0.4790	7
iv	3.990-6.941	216-234	0.6600-3.7130	12

The weight curve (Fig. 18D), using the same model, was obtained through the weight/length ratio (Fig. 18C), whose value of ø = 3.12 indicates nearly isometric growth (Mackey 1977; Balushkina 1982).

C. Emergence

The adults began to emerge 23 days after egg eclosion and continued for nearly 10 days, as shown in Figure 19. Under laboratory conditions, low mortality in both egg and larval stages was found, showing the species potential for bioassays.

Acknowledgments

We are grateful to Dr. F. Reiss for providing specimens from the Zoologische Staatssammlung, and to Dr. Reiss and M. Spies, Munich, for the judicious review of the manuscript.

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Cobitis (Bicanestrinia) rhodopensis, spec. nov. from Bulgaria

(Pisces, Cobitidae)

Milen Vassilev

Vassilev, M. (1998): *Cobitis (Bicanestrinia) rhodopensis*, spec. nov. from Bulgaria (Pisces, Cobitidae). – Spixiana **21/3:** 279-283

Cobitis rhodopensis, spec. nov. is described established from the Krumovitsa and the Biala Rivers, East Rhodope Mountain, Aegean Sea basin. This is the second representative of the subgenus *Bicanestrinia* in Bulgaria. The description of the new species, the biometrical characteristics of its morphological features, and the comparison with related species are given.

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Introduction

In this paper a new species of the genus *Cobitis* Linnaeus (1758) is described from the rivers Krumovitsa and Biala (South-Eastern Bulgaria, East Rhodope Mountain, Aegean Sea basin) that is included in the subgenus *Bicanestrinia* Bacescu (1961). The new species is compared with the two already known species of the subgenus *Bicanestrinia* in the European waters, namely *Cobitis trichonica* Stephanidis, 1974 from the lakes of Etolo-Acarnania (western part of mainland Greece) and *Cobitis peshevi* Sivkov & Dobrovolov, 1984 from main part of Eastern Bulgaria (Black Sea basin) and some tributaries of the Struma and the Maritsa Rivers (Aegean Sea basin).

The typical species of the subgenus *Bicanestrinia*, *Cobitis simplicispina* Hanco, 1924 was described from Asia Minor, together with *C. phrygica* Battalgil, 1944 and *C. battălgili* Bacescu. 1961. Bianco & Nalbant (1980) further added to that group the species *C. linea* Heckel, 1846 from Iran.

Material and methods

The material (35 specimens) was collected during summer 1995 in the Biala and the Krumovitsa Rivers (Aegean Sea basin). The samples have been taken from the middle and the lower sections of the rivers using ichthyological sacs.

Some measurements and descriptions of specimens were done in the field with fresh material. The further processing of material was carried out in the laboratory with samples fixed in 4 % formaldehyd. The morphological description is based on 8 meristic and 24 metric characters (Tab. 1). Comparisons with other species are based on data from the literature (Pellegrin 1928, Battalgil 1944, Berg 1949, Bacescu 1961, Stephanidis 1974, Bianco & Nalbant 1980, Sivkov & Dobrovolov 1984, 1986). The biometrical characters of the morphological features of *Cobitis rhodopensis* in tab. 1 are given for both males and females together, since there are no reliable differences in the average values of the measuring characters between sexes, exept for the body lenght.

In the statistical processing of data the CD of Mair (1971) and t-criterion of Student (Zaitsev 1984) are used.

Cobitis rhodopensis, spec. nov.
(Figs 1a, b)

Types. Holotype: ♂, 73 mm SL, caugth on 28.08.1995. in the middle flow of the Biala River (a tributary of the Maritsa River), downstream of the Meden buk village. Collected by the author and deposited in his collection No 199501C in the Department of Hydrobiology, Institute of Zoology, BAS, Sofia. – Paratypes: 34 specimens (18♂♂, 10♀♀, 6 juv.), caugth in June and August 1995 in the Krumovitsa River (a tributary of the Arda River) and the Biala River (in same collection as holotype).

Diagnosis. A species of the genus *Cobitis* (subgenus *Bicanestrinia*) with two scales of Canestrini on the two first rays of the pectoral fin in males. Body colouring similar to that of *C. taenia* (Berg 1949, Drenski 1951), differs by two (rarely one) black spots at the caudal base; the dark stripes on both sides of head do not extend behind the eyes. Males are smaller than females.

Tab. 1. Biometrical characteristic of the morphological features of *Cobitis rhodopensis*, spec. nov.

Characters	lim	x	S	n
SL(standard length) mm	55.0-85.5	66.10	10.11	24
D (dorsal fin rays)	7-8	7.25	0.45	24
A (anal fin rays)	5-6	5.33	0.49	24
P (pectoral fin rays)	8	8	0.00	24
V (ventral fin rays)	5-7	5.33	0.65	24
C (caudal fin rays)	16	16	0.00	24
sp. br. (gill rakers)	13-14	13.33	0.47	19
vt. (vertebrae)	39-41	39.62	0.78	20
In % to the body length SL				
lC (head length)	18.18-20.53	19.14	0.62	24
H (body depth)	14.54-16.96	16.05	0.85	24
mH (body width)	8.77-11.92	10.45	0.94	24
h (caudal peduncle depth)	9.09-11.02	10.04	0.46	24
mh (caudal peduncle width)	4.43- 5.93	4.88	0.43	24
AD (predorsal distance)	50.0 -52.27	50.88	0.89	24
PD (postdorsal distance)	40.43-42.02	41.42	0.55	24
AV (preventral distance)	50.36-52.98	51.50	0.84	24
AA (preanal distance)	75.45-78.95	76.85	1.11	24
lc (caudal peduncle length)	14.85-18.77	16.58	1.14	24
lD (basic dorsal length)	8.47- 9.94	9.32	0.44	24
HD (dorsal height)	15.20-17.80	16.38	0.83	24
lA (basic anal length)	6.85- 8.33	7.61	0.51	24
HA (anal height)	10.55-15.0	13.02	1.27	24
lP (pectoral length)	11.46-17.09	13.91	1.60	24
lV (ventral length)	10.99-14.18	12.32	1.12	24
P-V (pectoral-ventral distance)	29.67-32.76	31.26	0.96	24
V-A (ventral-anal distance)	23.97-27.64	25.84	1.24	24
In % to the head length lC				
r (snout length)	35.03-43.64	39.84	2.82	24
o (diameter of eye)	15.89-19.23	17.48	1.16	24
po (postorbital distance)	44.44-57.66	47.36	3.74	24
io (interorbital distance)	16.06-25.0	18.94	2.53	24
HC (head depth)	59.83-66.24	63.55	1.92	24
mC (head width)	47.0 -60.58	52.76	4.18	24

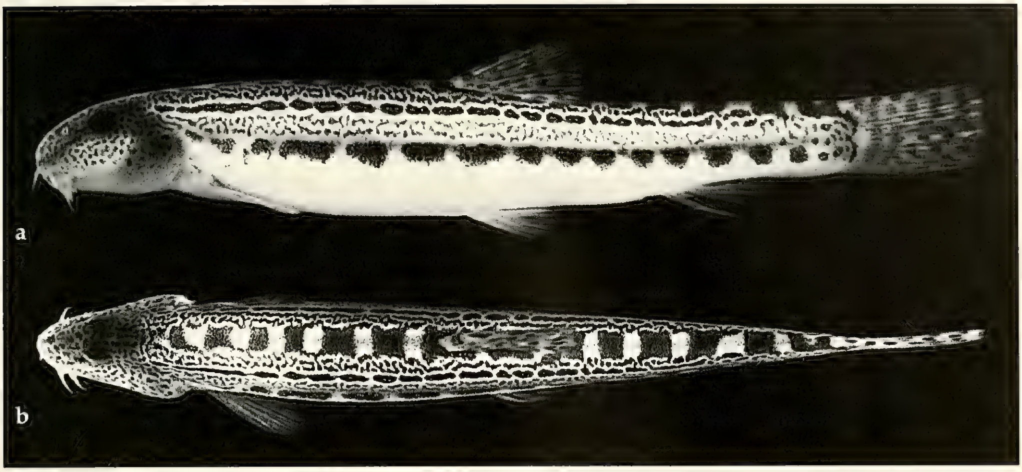

Fig. 1. *Cobitis rhodopensis*, spec. nov. (Biala River, 28.08.1995, SL=73 mm). **a.** Lateral view. **b.** Dorsal view.

Description

Dimensions. Males: 55.0-79.0 mm SL; females: 65.0-85.5 mm SL.

Fins. D II-III 7-8, A II-III 5-6, P I 8, V I 5-6 (7) I, C I 14 I; branchial spines 13-14, vertebrae 39-41.

Body elongated, laterally flattened, covered with minute rounded scales. Body depth (height) 5.9-6.9 times in SL, body width 8.4-11.4 times in SL. Head rounded in front, small (4.9-5.5 times in SL), triangular. Head depth larger then head width. Mouth lower with flesh lips. Lower lip bilobate, each lobe divided into two parts. Barbels longer and thiner in males than in females. Suborbital spin bifid, curved inwards. Diameter of eye smaller than or equal to the interorbital distance. Peduncle length 5.3-6.7 times in SL, peduncle depth about two times larger than peduncle width. Caudal peduncle with dermal keel on dorsal and ventral edges. Dorsal fin begins slightly before the ventral base. Caudal fin distinct, with rounded borders. Pectorals equally long in males and females. Males bear on each of the first two pectoral rays one scale of Canestrini. It is semi-circular, triangularly shaped (viewed over the pectoral fins), and covered by the membrane of the fin (Fig. 2a). The detached scales of Canestrini are irregularly-oval shaped with tentacles towards the base of the pectorals (Figs 2b, c). The first scale attached to the first ray, it is two times smaller than the second scale which is attached on the second ray. First scale partially overlaps the second one. In a single specimen only the third scale of Canestrini was found (under the second scale); it is attached to the second ray, is semi-circular and smaller and thinner than the other scales of Canestrini.

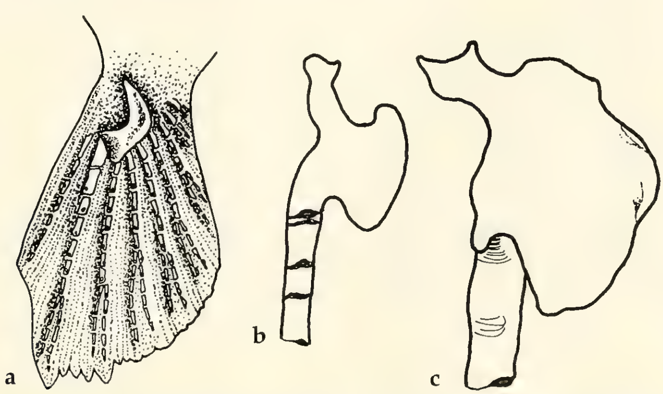

Fig. 2. *Cobitis rhodopensis*, spec.nov. Scales of Canestrini. **a.** The two scales on the pectoral fin. **b.** First scale of Canestrini. **c.** Second scale of Canestrini.

Coloration. Similar to those of *C. taenia, C. trichonica,* and *C. peshevi.* Basic colour yellowish. Zones of Gambetta well delineated. On the back 13-19 dark brown spots, mainly rectangularly shaped. The first and the third lines on each body side formed by numerous minute dark spots. The second and the fourth (lateral) lines consistof bigger, well separated, ellipsoidal or irregularly shaped brown spots. There are 13-18 spots in the lateral line. Usually two well delimited black spots (rarely one) at the caudal base. Spots usually dash shaped, one above the other, and the upper one sloping ahead. The upper black spot denser and larger than the lower one. Sometimes, the upper spot even almost two times larger than the lower one. Only one specimen had a single upper spot. The black spots at the caudal base well delimited even in the juvenile specimens. Head with many dots and speckles and with a dark line extending from the snout tip to the eye. Dorsal and caudal fins with 5-6 irregular rows of dark spots. Other fins usually without spots, light coloured.

Sexual dimorphism. Body lenght of males smaller than in females. No reliable differences in the length of the pectorals between males and females. Males have two scales of Canestrini. Barbels of males thinner and longer than those of females. In males the third pair of barbels (at the corner of the mouth) reach the vertical from the middle of the eye. In females they do not reach the vertical from the anterior border of the eye.

Distribution. So far, *Cobitis rhodopensis,* spec. nov. was found in the middle and the lower reaches of the Krumovitsa River, and along the Biala River (Aegean Sea basin). The first more complete ichthyologycal investigations in this region (East Rhodope Mountain) were carried out in 1995. *C. rhodopensis* is the only representative of the genus *Cobitis* in both rivers.

Discussion. Comparison with related species: *Cobitis rhodopensis,* spec. nov. is the third representative of the subgenus *Bicanestrinia* in Europe. The differences in comparison with the two European species *C. peshevi* and *C. trichonica,* and with *C. simplicispina,* a typical species of the subgenus from Asia Minor, according to data of Pellegrin (1928), Berg (1949), Bacescu (1961), Stephanidis (1974), and Sivkov & Dobrovolov (1986) are combined in tab. 2.

Tab. 2. Comparison between *C. simplicispina, C. trichonica, C. peshevi* and *C. rhodopensis.*

Characteristic	*Cobitis simplicispina*	*Cobitis trichonica*	*Cobitis peshevi*	*Cobitis rhodopensis*
1. Shape of the body scales	elongated	rounded	rounded	rounded
2. Rays of D	II 6	II (III) 7 (8)	III 7	II-III 7-8
3. Rays of A	II 6	II-III 5	III 5	II-III 5-6
4. Rays of V	I 6	II 6	II 5	II 5-6 (7)
5. Rays of P	I 7-9	I 7-8 (9)	I 7-8	I 8
6. Suborbital spin	bifid or not bifid, curved outwards	bifid, curved inward	bifid, curved inward	bifid, curved inward
7. Dermal keel	above and below the caudal peduncle	none	above and below the caudal peduncle	above and below the caudal peduncle
8. Lateral spots	none	7-15	14-20	13-18
9. Black spots of caudal base	none	2 (3)	none	2 (1)
10. Size of males	equal to the females	smaller than the females	smaller than the females	smaller than the females
11. Length of P fin in males and in females		smaller in females	smaller in females	equal size
12. Scales of Canestrini	2, elongated crescend shaped	2(3), triangular, fanlike, equal size	2, the 1th- elongated, the 2th-kidneylike	2(3), irregular oval shape, 1th two times smaller than 2th

As exemplified in tab. 2, *C. rhodopensis* is most similar externally to *C. peshevi* and *C. trichonica*, and shows greater differences to *C. simplicispina*. According to data and drawings from the works of Battalgil (1944), Bacescu (1961) and Bianco & Nalbant (1980), *C. rhodopensis* differs considerably more from the species of Asia Minor, *C. phrygica*, *C. battalgili* and from the Iranian species *C. linea*.

Exept for the characters N 3, 4, 5, 7, 8, 9, 11 and 12, shown in table 2, *C. rhodopensis* differs from *C. trichonica* by following additional characters: in accordance with Stephanidis (1974), the coloration in female specimens is more bright than that of males. *C. rhodopensis* also differs by the shape of the black spots at the caudal base. Spots in *C. rhodopensis* are more elongated, they are not oval-shaped or semi-circular as in *C. trichonica*. The upper spot in *C. rhodopensis* is always sloping ahead. Both species differ in coloration of dorsal and caudal fins: there are 3 irregular rows of dark spots in *C. trichonica*, while there are 5-6 in *C. rhodopensis*. *C. trichonica* has a shorter caudal peduncle (6.9-8.5 times in SL) than *C. rhodopensis* (5.3-6.7 times in SL).

Exept for the characters N 2, 3, 4, 5, 9, 11 and 12, given in table 2, *C. rhodopensis* differs from *C. peshevi* (and also from *C. trichonica*) by distinct sexual dimorfism of the barbels: only in the males of *C. rhodopensis* the third pair of barbels reach the vertical of the middle of the eye, while in the females they do not even reach the vertical from the beginning of the eye. *C. rhodopensis* has shorter preventral distance and larger body depth (AV-51.5 %, H-16.05 % to SL) than *C. peshevi* (AV-53.56 %, H-14.42 % to SL). *C. rhodopensis* has also longer interorbital distance and larger diameter of eye (io-18.94 %, o-17.48 % to lC) than *C. peshevi* (io-15.80 %, o-15.30 % to lC). *C. rhodopensis* has a lower number of vertebrae (39-41) than *C. peshevi* (40-43).

Comparison of *C. rhodopensis* and *C. peshevi* (according to data of Sivkov & Dobrovolov 1986) by 8 meristic and 16 metric characteristics shows 15 reliable differences using the t-criterion of Student (D, A, P, V, sp. br., vt., lC, H, PD, AV, lc, lP, lV, o, io) and two differences using CD of Mair. Using the last criterion, *C. rhodopensis* differs from *C. peshevi* in the number of vertebrae (CD=1.40), and in the preventral distance (CD=1,31).

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39. Schiemer, F. & K. T. Boland: Perspectives in Tropical Limnology. – SPB Academic Publishing, Amsterdam 1996, 347 S. ISBN 90-5103-113-0.

65 Jahre nach der Großen Limnologischen Sunda-Expedition, die von Franz Ruttner und August Thienemann geleitet wurde, fand an der Satya Wacana Christian University in Salatiga, Central Java, eine internationale Konferenz statt, die ein Forum der limnologischen Forschung in den Tropen heute dokumentiert. Gerade dieser Teil der Limnologie war in der Vergangenheit sehr unterrepräsentiert, so daß der Erfahrungsaustausch der Tagungstelnehmer im Vordergrund dieses Zusammentreffens vom 4.-8. 7.1994 stand. Der Mangel an wissenschaftlicher Bearbeitung der tropischen Gewässer steht in krassem Gegensatz zu der Bedeutung dieser Reservoirs für die gesamte Lebensgemeinschaft insbesondere der im Umfeld ansässigen Bevölkerung. Erst in jüngster Zeit wird auch der Einfluß dieser meist äquatorialen Zonen für die gemäßigten Breiten offensichtlich. Die vorgestellten Artikeln der vortragenden Tagungsteilnehmer zeigen die Probleme in den verschiedenen Ländern auf. Ein breites Spektrum limnologischer Forschung vor allem in Asien wird dargeboten, vom Reisfeld bis zu großen Seen, von Flüssen bis zu den Aubereichen. Vorangestellt ist jedoch die Historie und Bedeutung der Pioniere der ersten Limnologischen Expedition in diesen südostasiatischen Raum. Der Preis verhindert die Zugänglichkeit zu den vorgestellten Fakten. E.-G. Burmeister

40. Mandych, A. F.(hrsg.): Enclosed Seas and Large Lakes of Eastern Europe and Middle Asia. – SFB Academic Publishing, Amsterdam 1995, 273 S. ISBN 90-5103-110-6.

In diesem Band wird die Limnologie der Binnenmeere und Großen Seen in eigenständigen monographischen Abhandlungen dokumentiert. Die Bedeutung dieser Gewässer, besser Gewässersysteme erstreckt sich über jeweils ein bedeutendes Einzugsgebiet und zeigt auch die Abhängigkeiten der Bevölkerungen im jeweiligen Raum. Auch die anthropogenen Wandlungen werden den natürlichen Prozessen gegenübergestellt.Besonders am Beispiel des Aral-Sees haben die hydrologischen und biochemischen Strukturwandlungen katastrophale Ausmaße angenommen. Dieser wie auch andere der folgenden behandelten Gewässer wie das Asov'sche Meer, das Schwarze Meer, das Caspische Meer, der Baikal See, Issyk-Kul See und der Ladoga und Onega See sind als gesonderte monographische Bände (Autorenkollektive) in der gleichen Publikationsreihe erschienen. Hier wird eine jeweils eigenständige Zusammenfassung mit aktualisierten Daten vorgestellt. Diese sind angesichts des dramatischen Wandels und der fortschreitenden Beeinflussung besonders notwendig und ergänzen die Primärdaten in ganz wesentlicher Hinsicht. Der Preis verhindert die Zugänglichkeit dieser Zusammenfassung.

E.-G. Burmeister

41. Steinberg, C., Bernhardt, H. & H. Klapper: Handbuch Angewandte Limnologie – Grundlagen, Gewässerbelastung, Restaurierung, Aquatische Ökotoxikologie, Bewertung, Gewässerschutz. – ecomed Verlag, Landsberg 1995, c. 400 S. (Loseblatt-Sammlung). ISBN 3-609-75820-1.

Wasserwirtschaft und Limnologie arbeiten heute Hand in Hand. Ohne fundierte Kenntnisse in der Limnologie ist eine naturwissenschaftlich-orientierte Wasserwirtschaft nicht mehr durchzuführen. Die angewandte Limnologie besitzt gegenüber der klassischen nur eine kurze Historie, sie ist jedoch heute auf gesichertes Faktenwissen angewiesen. Der Einfluß von Veränderungen in limnischen Ökosystemen durch anthropogene Belastungen ist vielfach schwierig, da es sich meist um schleichende Prozesse handelt und die natürlichen Vorgänge weder rekonstruierbar noch vorhersehbar sind. Das bisher erschienene Werk – als Lochblattsammlung können die weiter erscheinenden Abschnitte zugeheftet werden – enthält dann als allgemeinen Teil Stichwort, Begriffs-und Literaturverzeichnis, einen Abriß über die Geschichte der Limnologie, die methodischen Grundlagen und die der allgemeinen Limnologie, strukturelle Veränderungen und Belastungen von Gewässern, die Restaurierung, die Gewässernutzung, Gewässserbewertung und vor allem rechtliche Fragen. Da einige Abschnitte noch komplett fehlen, ist eine Gesamtschau nicht möglich. Biotische Angaben kommen auch nach kompletter Inhaltsübersicht vermutlich etwas zu kurz. Die bisherige Lieferung verrät jedoch bereits das fachlich breite Spektrum und die gezielt aussagescharfe Dokumentation. Jedem Kapitel ist ein umfangreiches Literaturverzeichnis beigeheftet, das zur Klärung der Fragen dieses komplexen Wissensbereiches beitragen kann. E.-G. Burmeister

Buchbesprechungen

42. Blume, H.-P., Felix-Henningsen, P., Fischer, W. R., Frede, H.-G., Horn, R. & K. Stahr: Handbuch der Bodenkunde.– ecomed Verlag, Landsberg 1996 (Loseblatt-Sammlung). ISBN 3-609-72210-X.

Dieses Loseblattwerk, das bisher noch nicht vollständig ist und durch die erscheinenden Nachlieferungen ergänzt werden kann, zeigt den aktuellen Stand des bodenkundlichen Wissens 60 Jahre nach dem Erscheinen des Handbuches der Bodenlehre. So wird heute deutlich, daß ein Boden nicht nur eine Funktion, wie etwa Pflanzenproduktion in Land- und Forstwirtschaft, besitzt, sondern zugleich Filter bei der Grundwasserbildung und entscheidender Regulator des Wasserhaushaltes einer Landschaft darstellt. Seine Funktion als Lebensraum unzähliger heute noch nicht in seiner Gesamtheit und Komplexität erkannten Organismen wird leider nicht gewürdigt. Demgegenüber bilden die Darstellung von Boden und Böden, Böden als Naturkörper hinsichtlich des Mineralhaushaltes und der Humusbildung, Böden als Teile von Landschaften und deren Funktion nicht zuletzt als Urkunden landschafts- und kulturgeschichtlicher Epochen eine grundlegende Übersicht. Hinzu kommen lehrbuchhafte Zusammenstellungen von Bodenkultivierungen und Meliorierungen, sowie Angaben zu anthropogenen Bodenveränderungen und Belastungen wie Überformungen, Versiegelungen, Bewirtschaftung auf Profitgrundlage und Abtragung. Dagegen stehen die notwendigen Schutzvorkehrungen vor stofflichen Belastungen und die Bodensicherung, -sanierung und -restaurierung. Den Großabschnitten folgt eine umfassendes Literaturverzeichnis, das vertiefende Einblicke in diesen lebensgrundlegenden Bereich ermöglicht. Der stattliche Einzelpreis schränkt den Leserkreis bedauerlicherweise entscheidend ein. E.-G. Burmeister

43. Mason, F.: The Afrotropical Nemotelinae (Diptera, Stratiomyidae). – Monografie XXIV Museo Regionale di Scienze Naturali Torino, 1997, 6 Habitusbilder, 73 s/w-Tafeln, 3 Farbtafeln, 19 Verbr.-Karten. ISSN 1121-7545, ISBN 88-86041-20-9.

Die Unterfamilie Nemotelinae wurde erstmals 1989 im Katalog der Dipteren der Australis eingerichtet und wird im vorliegenden Buch um mehrere Gattungen erweitert. Dieses stellt ein hervorragendes Bestimmungswerk für die afrikanischen Arten der Gattungen *Lasiopa, Brachycara, Cluninemotelus, Epideicticus* und *Nemoteus* dar, die zusammen 39 Arten umfassen. Eine beeindruckende Fülle von Abbildungen umfaßt fast zwei Drittel des Buches. Zunächst wird die Unterfamilie charakterisiert und der Umfang an Gattungen festgelegt. Darauf folgt der systematische Teil mit Bestimmungsschlüsseln für die Gattungen und Arten und den ausführlichen Beschreibungen der Taxa einschließlich zahlreicher Neubeschreibungen. Zu jeder Gattung findet sich ein Habitusbild. Über die Hälfte des Buches nimmt der Abbildungsteil ein, bestehend aus 76 Tafeln und 19 Verbreitungskarten. Die Swarzweißtafeln zeigen stets den Körper mit seinem Zeichnungsmuster und die Genitalstrukturen der jeweiligen Art sowie weitere Körperteile, wie etwa den Flügel, einzelne Beine, den Kopf lateral und frontal u.s.w. Exemplare von 16 Arten werden farbig abgebildet. Ein ausführlicher Literaturteil und der Index beschließen das Buch. Ein Werk, das jedem überregionalen Dipterologen und jeder Zoologischen Bibliothek empfohlen werden kann. W. Schacht

44. Harvey, P. H., Leigh Brown, A. J., Maynard Smith, J. & S. Nee (eds.): New Uses for New Phylogenies. – Oxford University Press, Oxford, 1996. xi + 349 pp. ISBN 0-19-854985-7 hbk; 0-19-854984-9 pbk.

This book provides the proceedings of a meeting organized by the Royal Society in 1994. "New" means "Molecular" phylogenies and the whole volume concerns the illumination of this rapidly increasing field for various biological disciplines. The advantages and problems of the methods of phylogenetic reconstruction themselves are not part of this volume, however. All in all 20 chapters of various authors try to fulfil this approach, and the contributions are divided into four parts. Chapters of the first part introduce and exploit the power of the so-called coalescent approach within theoretical population biology. The second part takes over the results of the first one and applies the results to biological fields including epidemology, genome structure, macroevolution, and conservation biology. The third part shows possible combinations of molecular trees with other phylogenetic informations to improve the results with respect to character evolution, node accuracy, or patterns of evolution. Finally correlations of phylogenetic trees with ecology and developmental biology are considered.

This book is from experts for experts and not for the broad public. Nevertheless, it is a "must" for all those who are involved in or responsible for any kind of biosystematics, let it be based on phenotypes or genotypes. The contributions give many, various, and valuable answers for the overall systematic or better phylogenetic question: "Why should we want to know, which is the closest relative of that organism?" Last but not least the low price, in particular for the paperback version, lets me recommend this volume not only for experts of molecular phylogeny, but also for students, who are interested in phylogenetic systematics and its justification in general. G. Haszprunar

45. Moeller, H. F.: Der Beutelwolf. – Westarp Wissenschaften, Magdeburg, 1997 (Die Neue Brehm-Bücherei; Bd. 642), 195 S., 127 Abb. ISBN 3-89432-869-X.

Im Jahr 1930 wurde der letzte freilebende Beutelwolf in Tasmanien abgeschossen, 6 Jahre später starb das letzte Exemplar dieser Art im Zoo von Hobart/Tasmanien. Seitdem wird in der Tagespresse immer wieder über angebliche Spuren oder sogar Sichtungen noch lebender Exemplare berichtet. Angesichts der allgemeinen Aufmerksamkeit, die solche Meldungen hervorrufen, ist es verwunderlich, daß es bisher keine monographische Darstellung dieser interessanten Tierart gibt. Um so erfreulicher ist es, daß nun ein Autor, der sich seit 30 Jahren mit dem Beutelwolf beschäftigt und wie kaum jemand sonst Dokumenationsmaterial zusammengetragen und ausgewertet hat, diese Lücke schließt. Das trotz wissenschaftlicher Seriosität spannend geschriebene Buch behandelt alle Aspekte der Biologie des "Tasmanischen Tigers", von der Morphologie und Anatomie über Fortpflanzung, Bewegungsweisen und Verhalten bis hin zu Konvergenzerscheinungen mit plazentalen Raubsäugetieren. Dabei kann der Autor in vielen Bereichen auf Ergebnisse eigener Forschungsarbeiten zurückgreifen, da er wohl die meisten Beutelwolfpräparate, die in Museen und wissenschaftlichen Sammlungen aufbewahrt werden, selbst untersucht hat. Weitere Themenschwerpunkte sind die Entdeckungsgeschichte, Ursachen der Ausrottung sowie Haltung, Verweildauer und Schauwert in Zoos und Menagerien. Bei der Darstellung des Verhaltens ist es bewundernswert, wieviel biologische Informationen aus der Auswertung zeitgenössischer Zeichnungen, Fotos und einiger weniger Filmdokumente gewonnen werden konnten.

Bei der kritischen Bewertung angeblicher Sichtungen überlebender Exemplare kommt der Autor zu dem Schluß, daß keine einer stichhaltigen Überprüfung standhält, sofern es sich nicht ohnehin um bewußte Falschmeldungen handelt. Wider Erwarten existieren vom Beutelwolf noch relativ viele fotografische Lebendaufnahmen, teilweise sogar von hervorragender Qualität. Immerhin 31 davon wurden in das Buch aufgenommen! Zusammen mit dem informativen Text vermitteln sie ein überaus lebendiges Bild einer unwiederbringlich verlorenen zoologischen Rarität. Es ist sehr zu begrüßen, daß diese faszinierende Tierart nun in der Fachliteratur eine würdige Darstellung gefunden hat.

R. Kraft

46. Seeley, T. D.: Honigbienen. Im Mikrokosmos des Bienenstocks – Aus dem Amerikanischen von Ute Döring; Fachliche Beratung: Prof. Dr. J. Tautz. – Birkhäuser Verlag Basel, 1997, 368 S., ISBN 3-7643-5606-5.

Dieses Buch handelt davon, wie ein Bienenstaat als funktionelle Einheit organisiert ist. Im Mittelpunkt der vorgestellten Untersuchungen steht die Organisation des Nahrungserwerbes. Der Autor legt großen Wert darauf zu zeigen, welche Beobachtungen und experimentellen Untersuchungen die Grundlage für das gegenwärtige Verständnis des Bienenstaates bilden. Das Buch ist eine interessante Darstellung, die immer wieder an Hand von speziellen Beispielen den Blick auf grundlegende Fragen der Biologie öffnet. Das sehr gut geschriebene Werk ist sowohl für Zoologen als auch für interessierte Laien uneingeschränkt zu empfehlen.

K. Schönitzer

47. Ingrisch, S. & G. Köhler: Die Heuschrecken Mitteleuropas. – Westarp Wissenschaften, Magdeburg (Neue Brehm Bücherei, Bd. 629), 1998, 460 S. ISBN 3-89432-461-9.

Die Heuschrecken zählen heute zu den am meisten untersuchten Insektengruppen. Sie werden zunehmend häufiger für ökologische und faunistische Untersuchungen herangezogen. Die beiden Autoren, beide bekannte Heuschreckenspezialisten, legen ein gut fundiertes Kompendium zur Ökologie und Biologie der einheimischen Heuschrecken vor, in dem auch auf Systematik, Verhalten, Erfassung und Schutz der Heuschrecken eingegangen wird. Steckbriefe der einzelnen Arten sind leider nicht in dem Buch enthalten. Wer etwas über eine bestimmte Art oder Gattung sucht, muß im (nicht ganz vollständigen) Verzeichnis der wissenschaftlichen Namen nachschlagen. Leider fehlt ein Stichwortregister und ein Register der deutschen Namen. In dem Werk sind viele interessante Daten aus der Literatur zusammengetragen, wobei stets die genauen Quellen angegeben sind. Dementsprechend ist auch das ausführliche Literaturverzeichnis ein wertvoller und wichtiger Teil des Buches, das dem interessierten Leser den Weg zu den Originaldaten weist. Das Buch ist ein wichtiger Meilenstein für die weitere Erforschung der Ökologie und Biologie der mitteleuropäischen Heuschrecken, das uneingeschränkt empfohlen werden kann.

K. Schönitzer

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INHALT - CONTENTS